

FLORA  
OF  
THE UPPER GANGETIC PLAIN,  
AND OF THE  
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY  
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NORTHERN INDIA.

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NYCTAGINACEÆ TO CERATOPHYLLACEÆ.



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Flora of the Upper Gangetic Plain  
and of the adjacent  
Siwalik and Sub-Himalayan Tracts.

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LXXXIX.—NYCTAGINACEÆ.

Herbs, shrubs or trees. *Leaves* usually opposite, entire, ex stipulate. *Flowers* 2-(rarely 1-) sexual, regular, sometimes dimorphous; inflorescence various; bracts often forming an involucle, free or connate. *Perianth* small, monophyllous, usually petaloid, the tube persistent, enveloping the fruit; limb 3-5-lobed, persistent or deciduous, lobes plicate in bud. *Stamens* 1-30, hypogynous, sometimes unilateral; filaments usually unequal, inflexed in bud; anthers included or exserted, dorsifixed, didymous. *Ovary* free, 1-celled; style filiform, involute in bud, stigma simple or multifid; ovule solitary, basal, erect. *Fruit* membranous, indehiscent, enclosed in the hardened perianth-tube. *Seed* erect, testa adherent, albumen soft or floury, embryo curved or straight and with folded cotyledons, radicle inferior.—Species about 220, chiefly in Trop. America.

**BOERHAAVIA**, Linn. ; Fl. Brit. Ind. iv, 708.

Erect or diffuse herbs, often with divaricate branches. *Leaves* opposite, often unequally paired. *Flowers* small, arranged in panicles umbels or heads, pedicels jointed; bracteoles minute, often deciduous, rarely whorled and involucrate. *Perianth-tube*

long or short, ovoid below; limb funnel-shaped, 5-lobed. *Stamens* 1-5, exserted. *Ovary* oblique, stipitate, stigma peltate. *Fruit* small, 5-ribbed or -angled, viscidly glandular. *Embryo* hooked; cotyledons broad and thin, the outer the larger, enclosing soft scanty albumen.—Species about 30, in tropical and sub-tropical regions of both hemispheres.

Fruit glandular on the ribs, not at the crown:—

Leaves of each pair very unequal, entire or subundulate; flowers subcapitate, pink or purple . . . . .

1. *B. diffusa*.

Leaves of each pair nearly equal, repand-sinuate; flowers in umbels, long-pedalled, pink . . . . .

2. *B. repanda*.

Fruit with large semiglobose glands round the crown; flowers in whorls, usually white; leaves obtuse . . . . .

3. *B. verticillata*.

1. *B. diffusa*, Linn. *Sp. Pl.* 3; Royle *Ill. 312*; Watt *E. D.*; Cooke *Fl. Bomb.* ii, 480. *B. repens*, Linn.; *F. B. I.* iv, 709; Collett *Fl. Siml.* 410, fig. 131; Prain *Beng. Pl.* 862. *B. repens*, vars. *diffusa* and *procumbens*, *F. B. I.* l. c. and *Prain l. c.* *B. procumbens*, Roxb. *Fl. Ind.* i, 146.

A diffusely branched herb; root stout, fusiform, rootstock woody. *Stems* 2-3 ft. long, slender, prostrate or ascending, swollen at the nodes, minutely hairy and sometimes viscid or subglabrous, often tinged with purple. *Leaves* rather thick, arranged in unequal pairs at each node,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, ovate oblong or sub-orbicular, green and glabrous above, usually white beneath; base rounded or subcordate, margins subundulate, often pink; petioles about as long as the blade. *Flowers* minute, subcapitate, 4-10 together in small bracteolate umbels forming slender long-stalked axillary and terminal panicles; bracteoles lanceolate, acute. *Perianth*  $\frac{1}{8}$  in. long; tube glandular-hairy; limb red, funnel-shaped, with 5 narrow vertical bands outside. *Stamens* 2 or 3, slightly exserted. *Fruit*  $\frac{1}{8}$  in. long, clavate, rounded, viscidly glandular on the 5 broad blunt ribs.

An abundant weed within the area of this flora, and very variable in habit and pubescence according to soil and situation. *DISTRIB.*: Throughout India, ascending to 7,000 ft. in the warm valleys of the

Himalaya ; also in Ceylon and the Malay Peninsula ; extending to China, Africa, America and the Islands of the Pacific. The root is used medicinally and the leaves are eaten as a pot-herb. The viscid perianth-tube containing the fruit is easily detached and thus becomes widely distributed by animals.

2. *B. repanda*, Willd. *Sp. Pl.* i, 22 ; *Royle Ill.* 312 ; *F. B. I.* iv, 709 ; *Prain Beng. Pl.* 863 ; *Cooke Fl. Bomb.* ii, 480.

A diffuse subscandent herb, glabrous or pubescent ; branches 3-6 ft. long, cylindric, glabrous or nearly so. *Leaves* in nearly equal pairs, 1-3 in. long, triangular-ovate, acute or acuminate, repand-sinuate, glabrous above, pubescent beneath, base cordate or truncate ; petioles slender,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Umbels* 3-8-fld., on long slender peduncles ; pedicels filiform,  $\frac{1}{2}$ -1 in. long ; bracteoles lanceolate, acute. *Perianth* pink, about  $\frac{3}{4}$  in. long, lobes notched. *Stamens* 4 or 5, much exserted. *Fruit*  $\frac{1}{2}$  in. long, clavate, obscurely ribbed, rough with glandular projections.

Plentiful within the area, and often found climbing amongst bushes. *DISTRIB.* : Throughout the W. Peninsula ; also in Ceylon, Baluchistan and Burma, extending to China and Australia.

3. *B. verticillata*, Poir. *Encycl. Méthod.* v. 56 ; *F. B. I.* iv, 710 ; *Cooke Fl. Bomb.* ii, 480. *Vern. Satha (Merwára).*

A decumbent or climbing annual or perennial herb ; branches long, pale, terete, glabrous. *Leaves* thick,  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. long, often broader than long, broadly ovate or suborbicular, obtuse, mucronate, usually glabrous, margins sinuate, base usually cordate, petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. *Flowers* in long-peduncled racemes, arranged in distant few-flowered whorls on a slender rhachis ; bracteoles small, ovate-oblong, acute, deciduous, pedicels slender. *Perianth* usually white,  $\frac{1}{2}$  in. long, lower portion constricted above the ovule, limb funnel-shaped, lobes 2-fid. *Stamens* slightly exserted. *Fruit*  $\frac{1}{2}$  in. long, clavate, with large semi-globose glands round the crown.

Merwara in Rajputana (Duthie). *DISTRIB.* : Punjab, Sind and in the drier parts of the W. Peninsula ; also in Afghanistan and Baluchistan, extending westwards to Syria and Trop. Africa.

The following plants belonging to genera introduced from South America, are much grown in the gardens of North India :—

**MIRABILIS JALAPA L.** (Marvel of Peru)—A tall much-branched perennial herb, bearing a profusion of yellow white crimson or variegated flowers. It is cultivated in all parts of India, and is sometimes

met with as an escape. The structure of the flowers is very similar to that of *Boerhaavia*. The leaves and flowers are used in native medicine under the name of *gul-abbas*.

**BOUGAINVILLEA SPECTABILIS**, Willd. A robust thorny extensively climbing shrub with softly pubescent branches and leaves. It bears masses of flowers during the hot season, and at that time becomes a very beautiful and conspicuous object by reason of its large and brilliant purple-coloured bracts. A very handsome variety known as *B. lateritia*, with crimson or brick-red bracts, was introduced into India about 30 years ago, and from the two original plants, now at Saharanpur, the gardens in other parts of India have been supplied.

**B. GLABRA**, Choisy is also largely cultivated in gardens. It is less robust as a climber, and almost devoid of thorns; the branches and leaves are glabrous and the bracts are magenta-coloured. It flowers more or less throughout the year.

#### XC.—AMARANTACEÆ.

Herbs, rarely undershrubs, erect or with climbing branches. Leaves opposite or alternate, exstipulate. Flowers small, usually 2-sexual, (rarely dioecious or polygamous), arranged in terminal simple or panicled spikes cymes or clusters, the outer flowers of a cluster sometimes deformed; bracts hyaline or scarios, never leaf-like bracteoles 2, scarios. Perianth dry, persistent, usually of 5 free or slightly connate hyaline or scarios segments, imbricate in bud. Stamens 1-5, opposite the perianth-segments; filaments usually connate below or united with intervening membranous staminodes in a hypogynous cup; anthers 1-or-2-celled. Ovary 1-celled; style sometimes simple or obsolete and with a capitellate or small stigma, or 2-3-fid. with acute stigmas, or styles 2-3, erect or recurved and stigmatic on the lower face; ovules 1 or more, amphitropous, erect or suspended from free basal funicles. Fruit a membranous utricle, rarely a circumscissile or irregularly bursting capsule, very rarely a berry enclosed in or supported by the persistent perianth. Seed inverted or erect, orbicular ovate or reniform, compressed, testa crustaceous; embryo horseshoe-shaped or annular, surrounding the floury albumen.—Species about 500,

inhabiting tropical and sub-tropical regions. The family is closely allied to the *Chenopodiaceæ*, differing chiefly in habit.

✓ Leaves alternate ; staminodes none :—

Ovary 2-many-ovuled :—

A shrub with scarlet berries . . . . . 1. DEERINGIA.

Herbs with circumscissile capsules . . . . . 2. CELOSIA.

Ovary 1-ovuled ; ovule erect :—

Flowers 2-sexual, in spikes ; fruit a crustaceous nut . . . . . 3. DIGERA.

Flowers monœcious or polygamous :  
fruit an indehiscent or circumscissile utricle . . . . .

4. AMARANTUS.

✓ Leaves alternate or fascicled or with opposite and alternate leaves mixed ; stamens with interposed staminodes . . . . .

5. ÆRUA.

✓ Leaves all opposite (not fascicled) ; stamens with or without interposed staminodes :—

Anthers 2-celled :—

Flowers all perfect, in spikes :—

6. NOTHOZERVA.

✓ Stamens 2 ; staminodes none . . . . .

7. ACHYRANTHES.

✓ Stamens 5, with interposed staminodes . . . . .

Flowers fascicled, each fascicle containing one perfect flower and several sterile ones the perianth-segments of which become converted into spreading hooked bristles ; staminodes none . . . . .

8. PUPALIA.

Anthers 1-celled . . . . . 9. ALTERNTHERA.

### 1. DEERINGIA, *R. Br.* ; *Fl. Brit. Ind.* iv, 714.

Rambling or climbing undershrubs. Leaves alternate, petioled. Flowers small, in simple or panicled spikes, 2- sexual or polygamodioecious ; bracts and bracteoles scarious. Perianth-segments 5, sepaline, free and equal or nearly so, membranous or herbaceous, spreading in fruit. Stamens 4 or 5, connate below in a hypogynous cup ; anthers broadly oblong, 2-celled. Ovary ovoid or sub-globose, sessile or stipitate ; styles 2 or 4, subulate, connate below, uniformly papillose throughout, or small sessile and capitellate ;

ovules few or many, on long funicles. *Fruit* a small globose berry seated on the persistent spreading perianth. *Seeds* few or many, reniform, compressed; testa black, shining, aril none; embryo annular, surrounding the floury albumen; cotyledons linear, radicle descending. Species 5-6, in Asia, Australia and the Pacific Islands, and one in Madagascar.

**D. celosioides**, *R. Br. Prod.* 413; *Roxb. Fl. Ind. i.* 682; *Royle Ill.* 320; *F. B. I. iv.* 714; *Kanjilal For. Fl. ed. 2.* 323; *Gamble Man.* 550; *Collett Fl. Siml.* 412; *Prain Beng. Pl.* 866; *Brand. Ind. Trees* 518. *Cladostachys frutescens*, *Don Prod.* 76 (excl. syn.) *Vern. Latman (Hind.)*, *chundri* (Dehra Dun).

A climbing shrub with long slender arching striate branches; bark thin, rough, dark-grey. *Leaves* 2-4 in. long, ovate or broadly lanceolate, acuminate, entire; base rounded or acute, rarely cordate, petiole  $\frac{1}{2}$ - $\frac{1}{4}$  in. long. *Flowers* small, pale yellowish-green, shortly pedicelled, arranged in simple or branching racemes 4-10 in. long and forming terminal panicles, bracts acute. *Styles* usually 3. *Berry* globose,  $\frac{1}{2}$ - $\frac{1}{4}$  in. in diam., supported by the persistent spreading perianth-segments, scarlet when ripe. *Seeds* usually 3.

Found in hedges and on the outskirts of forests in Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during Sep. and Oct., and in the cold season the panicles of scarlet berries render it a conspicuous object. *DISTRIB.*: Subtrop. Himalaya from the Sutlej to Bhutan, up to 5,000 ft.; also in Chota Nagpur, Assam, the Khasia Hills, Bengal and Upper Burma; extending to the Malay Islands, China and Australia. Kanjilal states that the juice of the fruit can be used as a substitute for red ink.

## 2. CELOSIA, Linn.; Fl. Brit. Ind. iv, 714.

Usually annual herbs, the stems often woody below. *Leaves* alternate, usually petioled. *Flowers* 2-sexual, in dense terminal and axillary spikes, sessile or shortly pedicelled, white or coloured; bracts and bracteoles scarious, shining. *Perianth-segments* 5, connate below, scarious, erect in fruit. *Stamens* 5, filaments united below in a membranous cup; anthers 2-celled; staminodes none. *Ovary* 1-celled, containing 2 or more ovules attached to long funicles; styles short or long or none, sometimes elongating in fruit; stigmas simple or 2-3, subulate. *Fruit* a circumscissile

capsule, membranous or sometimes corky or coriaceous. Seeds 2 or more, erect, lenticular; testa crustaceous, black and often shining; embryo annular, surrounding the floury albumen; cotyledons linear, radicle descending or ascending. Species about 35, in Trop. Asia, Africa and America.

**C. argentea**, Linn. *Sp. Pl.* 205; Roxb. *Fl. Ind.* i, 678; Royle *Ill.* 320; F. B. I. iv, 714; Watt. *E. D.*; Collett *Fl. Siml.* 412; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 485. *C. margaritacea*, Linn.; *Don Prod.* 76.—Vern. Safed murga-ka-phul.

An erect glabrous annual, 1-3 ft. high. Stem stout or slender, simple or branching. Leaves 1-4 in. long, linear or narrowly lanceolate, rarely ovate, tapering into a short petiole or sessile. Flowers pink when young, becoming white and glistening, closely imbricate and forming blunt or acuminate cylindric terminal spikes 1-6 in. long and sometimes branching at the apex; bracteoles shorter than the perianth, linear-lanceolate. Perianth  $\frac{1}{3}$  in. or more; segments linear-lanceolate, acute. Capsule  $\frac{1}{3}$ - $\frac{1}{2}$  in. long, elipsoid. Seeds 4-8, compressed, subreniform,  $\frac{1}{8}$  in. in diam.

Abundant within the area, especially on cultivated ground. Flowers during the end of rainy season. DISTRIB.: Throughout India, cultivated or as an escape, ascending to 5,000 ft. on the Himalaya; also in Ceylon, and as an introduction in most tropical countries. Its native country is not known for certain. The plant is used as a pot-herb in times of scarcity and the seeds are employed medicinally.

**C. CRISTATA**, Linn.; Roxb. *Fl. Ind.* i, 679; *Don Prod.* 76; Royle *Ill.* 320; F. B. I. iv, 715; Watt *E. D.*; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 486. *C. cernua*, Roxb. *I. c.* 680. Vern. Murgha-ka-phul (Cocksecomb).

Closely allied to the preceding, but usually a taller plant and with broader leaves and much smaller flowers. It is cultivated in gardens as an ornamental plant throughout India and up to 5,000 ft. on the Himalaya. It has pink crimson or yellow flowers borne on the usually fasciated and crest-like divisions of the spikes. It is often found as an escape, but never truly wild.

### 3. **DIGERA**, Forsk.; *Fl. Brit. Ind.* iv, 717.

An annual herb; branches angular. Leaves alternate, entire, petioled. Flowers in axillary peduncled spikes, ternate, the 2

outer reduced to crested scales, the central one perfect. *Perianth* sub-membranous, calycine; segments 5, slightly connate below, oblong, erect, the 2 outer larger. *Stamens* 5, hypogynous; filaments free, filiform; anthers 2-celled; staminodes none. *Ovary* 1-celled, oblong, compressed, truncate; style filiform; stigmas 2, recurved; ovule solitary, erect. *Fruit* a subglobose crustaceous nut, included in the perianth. *Seed* subglobose, erect; testa thin, crustaceous, brown, adhering to the albumen, embryo annular, cotyledons linear, radicle descending. A single species, occurring in India and Ceylon, and extending to Afghanistan, Baluchistan, Arabia and N. Africa.

**D. arvensis.** *Forsk. Fl. Egypt.-Arab.* 65; *Royle Ill.* 320; *F. B. I.* iv, 717; *Watt E. D.*; *Prain Beng. Pl.* 868; *Cooke Fl. Bomb.* ii, 487. *Achyranthes alternifolia*, *Roxb. Fl. Ind.* i, 674.

A slender annual weed of cultivation, or sometimes becoming perennial and with spreading prostrate branches. *Leaves* glabrous, very variable,  $\frac{1}{2}$ -3 in. long, ovate or elliptic, acute or rounded at the apex, base rounded or cuneate, margins often tinged with red; petioles slender,  $\frac{1}{2}$ -1 in. long. *Flowers* sessile, forming lax axillary peduncled spikes 1-5 in. long; bracts and bracteoles shorter than the perianth, ovate-lanceolate, acute, submembranous, persistent. *Perianth* pink,  $\frac{1}{8}$  in. long; segments ovate-oblong, acute. *Fruit*  $\frac{1}{8}$ - $\frac{1}{16}$  in. in diam., slightly compressed and margined, muriculate.

Common and widely distributed over the area of this flora, flowering usually after the rains are over. *DISTRIB.*: Plains of N. India from the Punjab to Bengal, and in Western C. and S. India; extending to Ceylon, Afghanistan, Baluchistan, Arabia and N. Africa. The leaves are often used as a pot-herb.

#### 4. AMARANTUS, Linn.; Fl. Brit. Ind. iv, 718.

Erect or decumbent annual herbs. *Leaves* alternate. *Flowers* small, monocious or polygamous, arranged in axillary clusters or in dense terminal and axillary spikes or panicles; bracts herbaceous, often persistent; bracteoles 2. **MALE fl.**: *Perianth* of 5 (rarely 1-3) membranous ovate-lanceolate segments. *Stamens* 5 (rarely 1-3); filaments free, subulate or filiform; anthers 2-celled; staminodes none. **FEM. fl.** *Perianth-segments* oblong or spatulate, erect in fruit. *Ovary* ovoid, compressed; style short or none, stigmas 2 or

3 ; ovule solitary, subsessile, erect. *Fruit* an orbicular or ovoid compressed utricle, or a circumscissile membranous or coriaceous capsule, entire or 2-3-toothed at the apex. *Seed* erect, orbicular, compressed, testa crustaceous; embryo annular, enclosing the floury albumen, cotyledons linear, radicle inferior. The number of species cannot be definitely determined, as a large proportion of those described as such are known only in cultivation. Many of them are widely distributed in tropical and subtrop. regions of the world either cultivated or as weeds.

Bracteoles awned or setaceous, equaling or exceeding the sepals; fruit dehiscent, circumscissile :—

Stamens 5; Sepals 5 :—

Leaf-axils with 5 spines; stems terete; leaves ovate or oblong, obtuse; bracts setaceous; flowers in dense or lax spikes . 1. *A. spinosus*.

Leaf-axils not spinous; stems striate; leaves elliptic or ovate-lanceolate; bracts acicular; spikes thyrsoid :—

Leaves acute or acuminate; bracts recurved, much exceeding the oblong-lanceolate acuminate sepals . . . . 2. *A. paniculatus*.

Leaves obtuse, rarely acute; bracts hardly recurved, not greatly exceeding the oblique mucronate sepals . . . . 3. *A. caudatus*.

Stamens 3; sepals 3; leaves obtuse or emarginate :—

Stems branching above the middle, yielding under cultivation only one crop annually . 4. *A. gangeticus*.

Stems branching near the base, yielding several crops annually . . . . 5. *A. gangeticus* var. *tristis*.

Bracteoles acute, hardly awned, shorter than the sepals; fruit usually indehiscent; leaves obtuse, rounded or notched :—

Stamens 3; sepals 3 :—

Fruit with an acute apex, indehiscent, rugose; clusters axillary and in terminal panicled slender spikes . . . . 5. *A. viridis*.

Fruit blunt at the apex :—

Fruit orbicular or broadly ovate, indehiscent, membranous :—

Procumbent ; leaves small, 2-lobed ; clusters all axillary . . . . 6. *A. Blitum.*

Tall, succulent ; leaves large, oblong or rounded ; clusters axillary and in terminal simple or lobed spikes . *A. Blitum* var. *oleracea*.

Fruit ovoid, rugose, indehiscent or dehiscent ; leaves obtuse, rarely retuse or 2-lobed ; clusters all axillary . . . . 7. *A. polygamus.*

Stamens 2 ; sepals 2 ; fruit orbicular, compressed, membranous, indehiscent ; clusters minute, all axillary ; leaves small, linear-oblong, obtuse or 2-lobed at the apex . . . . 8. *A. tenuifolius.*

1. *A. spinosus*, Linn. Sp. Pl. 991 ; Roxb. Fl. Ind. iii, 611 ; F. B. I. iv, 718 ; Watt E. D. ; Comm. Prod. Ind. 63 ; Frain Beng. Pl. 869 ; Cooke Fl. Bomb. ii, 488.—Prickly Amaranth.

An erect spinous herb. Stems terete, glabrous, hard, often tinged with red ; branches grooved, armed with sharp straight divaricate spines in the leaf axils. Leaves  $1\frac{1}{2}$  in. long, ovate or lanceolate, obtuse and spine-tipped, glabrous on upper surface, often scurfy beneath ; main lateral nerves close, prominent beneath ; petiole equalling or shorter than the blade. Flowers many, sessile, in dense axillary clusters or in terminal and axillary more or less interrupted spikes ; bracts usually longer than the sepals, linear and tipped with a bristle. Perianth of male flowers  $\frac{1}{16}$ - $\frac{1}{8}$  in. long, with ovate acute bristle-tipped segments ; perianth of female flowers much smaller and with oblong obtuse apiculate segments. Stamens 5. Capsule  $\frac{1}{16}$  in. long, ovoid, thickened above, rugose ; styles 2, spreading. Seeds black and shining.

Found abundantly in all parts of the area, and often troublesome as a weed in fields and gardens. DISTRIB. : Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya ; extending to all tropical countries. The ashes of this plant are used in dyeing, the leaves are often eaten as spinach, and the roots are much used in native medicine.

2. *A. paniculatus*, Linn. Sp. Pl. ed. 2, 1406; F. B. I. iv, 718; Watt E. D.; Comm. Prod. Ind. 63; Duthie Field and Gard. Crops, N. W. Prov. and Cudh, part iii, 23, t. 68; Collett Fl. Siml. 411; Prain Beng. Pl. 870; Cooke Fl. Bomb. ii, 489; A. frumentaceus, Buch.-Ham. in Roxb. Fl. Ind. iii, 609; Royle Ill. 320; A. DC. L'Orig. Pl. Cult. 382. A. Anardana, Buch.-Ham.; Royle Ill. 321.—Vern. Chua, marsa, bathu, etc.

A tall robust annual, up to 6 ft. high or more. Stem stout, grooved striate and often tinged with red. Leaves 2-6-in. long, elliptic or ovate-lanceolate, acute or acuminate, base cuneate; main lateral nerves slender, prominent beneath; petioles 1-4 in. long. Spikes dense, many-flowered, subsquarrose, red, green or golden-coloured, the whole forming a thyrsoid panicle of which the central spike is the longest; bracts recurved, much longer than the sepals. Perianth  $\frac{1}{10}$ - $\frac{1}{8}$  in. long. Sepals 5, oblong, lanceolate, acute and shortly awned. Stamens 5. Fruit a capsule,  $\frac{1}{8}$  in. long, ovoid and narrowing to the apex; styles usually 3, short. Seeds subglobose, white, red or black.

Cultivated as a cold-season crop within the area, but chiefly in the Sub-Himalayan tracts; it is also found as an escape. The minute seeds are very nutritious and afford wholesome food for a large number of the poorer class of natives. DISTRIB.: Largely grown as an autumn crop on the outer Himalayan ranges up to 10,000 ft. or more, as well as in the hilly districts of Peninsular India. It forms a very handsome crop when in full flower, especially on the Himalaya where it is usually grown in terraces, the crimson and golden kinds mixed together. The plant occurs also in E. and W. Asia and in Africa, either cultivated or as an escape.

3. *A. caudatus*, Linn. Sp. Pl. 990; F. B. I. iv, 719; Watt E. D.; Comm. Prod. Ind. p. 63; Duthie Field and Gard. Crops, part iii, 24, t. 68 A; Collett Fl. Siml. 411; Prain Beng. Pl. 870; Cooke Fl. Bomb. ii, 491.—Vern. Kedári-chua.

Similar in many respects to *A. paniculatus*, but in its typical state it may be distinguished by its smaller size, the obtuse leaves and by the very long and drooping terminal spike; the bracts also, which are hardly recurved, do not greatly exceed in length the obovate mucronate sepals; also the utricle and seeds are smaller, the latter, as in *A. paniculatus*, varying very much in colour and shape.

This plant is cultivated for its grain in the northern portion of the area as a cold season crop, and also on the neighbouring Himalaya, where,

the grain is known under the name of *rámdána*. It is much grown in English gardens as well as in India as an ornamental plant under the name of "Love-lies-bleeding." In the warmer parts of Africa it takes the place of *A. paniculatus* as a grain-yielding crop.

4. *A. gangeticus*, Linn. *Syst. Nat. ed. 10, 1268*; *Roxb. Fl. Ind.* *iii*, 606; *Royle Ill. 321*; *F. B. I. iv*, 719; *Watt E. D.*; *Comm. Prod. Ind.* 62; *Duthie Field and Gard. Crops*, part *iii*, 17, *t. 67*; *Prain Beng. Pl. 870*; *Cooke Fl. Bomb. ii*, 489. *A oleraceus*, Willd. (*not Linn.*); *Roxb. l. c. 605*; *Watt E. D.*; *Comm. Prod. Ind.* 62. *A. lanceolatus*, *Roxb. l. c. 607*; *Watt E. D.*; *Comm. Prod. Ind.* 62. *A. atropurpureus*, *Roxb. l. c. 608*; *F. B. I. iv*, 722; *Watt E. D.* *A. tricolor*, Willd.; *Roxb. l. c. 608*. *A. melancholicus*, Willd.; *Roxb. l. c. 608*; *Royle Ill. 320*; *Watt E. D.* *A. lividus*, Willd.; *Roxb. l. c. 605*; *Watt E. D.*; *Comm. Prod. Ind.* 62.—*Vern. Lál-sag, chaulai-ság, labra* (Merwara).

An erect stout glabrous annual. *Stem* 2-4 ft. high, branching above the middle, grooved and striate, glabrous or nearly so, often tinged with purple. *Leaves* very variable both as to size and colour, rhomboid or deltoid-ovate, obtuse or emarginate and often apiculate at the apex, tapering to the base and decurrent on the petiole; petioles up to 3 in. long. *Flowers* in axillary clusters and also forming long interrupted spikes; bracts membranous, exceeding the perianth, narrowly lanceolate and tipped with a slender awn. *Perianth*  $\frac{1}{6}$  in. long. *Sepals* 3, lanceolate, tipped with a long capillary awn. *Stamens* 3. *Capsule*  $\frac{1}{6}$  in. long, ovoid abruptly narrowed at the apex, rugose, membranous; styles 3, distinct. *Seeds* lenticular, black and shining.

Largely cultivated throughout India and in Ceylon and in other parts of Tropical Asia; also in Trop. Africa and America. This is an extremely variable plant especially in Bengal. The species described by Roxburgh, and enumerated above as synonyms of *A. gangeticus*, are regarded by Prain as representing well-marked races, some of which, and more particularly *A. oleraceus*, include many more or less distinguishable and definite sub-races or cultivated forms.

VAR. *tristis*, *Prain Beng. Pl. 870*; *Cooke Fl. Bomb. ii*, 490. *A. tristis*, Willd.; *Roxb. Fl. Ind. iii*, 604. *A. polygamus*, Willd. (*not of Linn.*); *Roxb. l. c. 603*. *A. mangostanus* L.; *F. B. I. iv*, 720; *Watt E. D.*; *Prain Beng. Pl. 871*. An annual herb, branching from near the base. The leaves are as variable in shape and colour as are those of the type, from which it chiefly differs in that the plants can be cut down several times without injuring them, a new crop of shoots springing

up. Roxburgh states that the plant is known only in cultivation, and that it is held in great esteem as a pot-herb by all classes of the natives.—*A. mangostanus*, L. is very probably only a stunted and prostrate form of *A. gangeticus*, or a feral state of the variety *tristis* as suggested by Prain. *A. polygamus* of Roxburgh (now regarded as a synonym of *A. tristis*) is described by him as sometimes having the terminal clusters in spikes as in *A. gangeticus*.

5. *A. viridis*, Linn. *Sp. Pl. ed. 2, 1405*; *Roxb. Fl. Ind. iii, 605*; *F. B. I. iv, 720*; *Watt E. D.*; *Comm. Prod. Ind. 63*; *Prain Beng. Pl. 871*; *Cooke Fl. Bomb. ii, 490*. *A. fasciatus*, *Roxb. l. c. 609*.

An erect much-branched glabrous annual, 1-2 ft. high; branches sulcate, often tinged with purple. *Leaves* 1-3 in. long, ovate or deltoid-ovate, rounded and usually notched at the apex, the base truncate or cuneate, petioles  $\frac{1}{2}$ -2 in. long. *Flowers* shortly stalked, pale-green, arranged in small axillary clusters and in slender axillary and terminal panicled spike-like racemes; bracts shorter than the sepals, ovate-oblong, acute, membranous and with a green keel. *Sepals* 3, similar to the bracts, but longer. *Stamens* 3. *Fruit* indehiscent, compressed, suborbicular, acute, rugose. *Seeds* minute, lenticular, black and shining.

A common weed in cultivated ground throughout India, flowering during the rainy and cold seasons. It is widely distributed in all tropical countries, and may be easily recognised by its slender panicled spikes and indehiscent herbaceous fruits. The tender tops are eaten. Roxburgh's *A. fasciatus* is regarded as a sport with a pale crescent-shaped band across the leaf.

6. *A. Blitum*, Linn. *Sp. Pl. 990*; *F. B. I. iv, 721*; *Watt E. D.*; *Prain Beng. Pl. 871*.

A glabrous procumbent annual. *Leaves* small, long-petioled, oblong ovate or rounded, usually 2-lobed at the apex; base acute. *Flowers* in axillary clusters. *Sepals* 3, shorter than the utricle, linear-oblong or lanceolate, obtuse and apiculate or acute. *Stamens* 3. *Utricle* orbicular or broadly ovate, membranous, usually indehiscent.

A common weed throughout India and in Ceylon, extending to many other countries in temperate and tropical regions. The plant is much used as a pot-herb in India.

VAR. *oleracea*, *F. B. I. iv, 721*; *Watt E. D.*; *Duthie Field and Garden Crops, part iii, 18*; *Prain Beng. Pl. 871*; *Cooke Fl. Bomb. ii, 490*.—*Vern. Chaulai*.—A tall erect glabrous succulent herb. *Stem* stout,

grooved and striate. Leaves  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, ovate-oblong or rounded, usually notched at the apex; base cuneate; nerves prominent beneath; petioles  $1\frac{1}{2}$  in. long. Flowers in axillary clusters and in terminal simple or branched spikes; bracteoles shorter than sepals. Sepals 3, linear-oblong, obtuse or acute. Stamens 3. Utricle  $\frac{1}{10}$  in. long, broadly ovate and with a blunt apex; styles 3, very short. Seeds lenticular, dark-brown and shining.—Cultivated throughout India and in Ceylon. The leaves are extensively used as a pot-herb, and in the submontane tracts of Garhwal and Kumaon; this plant is grown also for its grain, and the parched seeds are either eaten with milk or mixed with sugar and made up into sweetmeat balls (*lādūs*).

7. *A. polygamus*, Linn. *Acad. iv*, 294; *Royle, Ill.* 321; *F. B. I. iv*, 721; *Watt E. D.*; *Comm. Prod. Ind.* 63; *Prain Beng. Pl.* 871; *Cooke Fl. Bomb. ii*, 491. *A. polygonoides*, Willd.; *Roxb. Fl. Ind. iii*, 602; *Royle l. c.*

A diminutive annual glabrous weed. Stems prostrate or ascending, striate. Leaves  $\frac{1}{2}$ -1 in. long, obovate, obtuse, rarely retuse or somewhat 2-lobed at the apex, often rigid and apiculate, base tapering; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long. Flowers few, in axillary clusters; bracteoles membranous, shorter than the sepals, lanceolate-oblong, slightly awned, mid-nerve prominent. Perianth  $\frac{1}{10}$ - $\frac{1}{10}$  in. long. Sepals 3, ovate-oblong, awned. Stamens 3. Fruit ovoid, rugose, tapering upwards, usually circumscissile; styles 3, distinct. Seeds lenticular, black and shining.

A common weed in gardens and cultivated land throughout India and in Ceylon, extending to Trop. Africa. Though not cultivated, this plant is largely used in India as a pot-herb, and is considered to be very wholesome. It is closely allied to *A. Blitum*.

8. *A. tenuifolius*, Willd. *Sp. Pl. iv*, 381; *Roxb. Fl. Ind. iii*, 602; *F. B. I. iv*, 722; *Watt E. D.*; *Prain Beng. Pl.* 871; *Cooke Fl. Bomb. ii*, 491.

A glabrous annual weed; branches many from the root, 6-18 in. long, spreading, prostrate or ascending. Leaves  $\frac{1}{2}$ -1 in. long, linear or oblanceolate-oblong, rounded and usually notched at the apex, base tapering; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, often obscured by the decurrent leaf-blade. Flowers in minute axillary clusters, bracteoles shorter than the sepals, ovate-lanceolate, obtuse, mid-nerve green. Perianth  $\frac{1}{10}$  in. long. Sepals 2, ovate-oblong, subacute, concave. Stamens 2. Utricle indehiscent,  $\frac{1}{10}$  in. in diam., orbicular, compressed, membranous, plicate when dry. Seeds lenticular, brown and shining.

A common weed in the plains of N. India; also in Western India, extending to Trop. Africa and other warm countries.

5. *ÆRUA*, Forsk.; Fl. Brit. Ind. iv, 727.

Erect prostrate or climbing herbs or undershrubs, often woody. *Leaves* alternate opposite or fascicled. *Flowers* small or minute, in simple or panicled spikes, 2-sexual or polygamous; bracts and bracteoles small. *Perianth* membranous or papery, sepaleine, 5 (rarely 4)-lobed; segments equal or the outer broader. *Stamens* 5, rarely 4; filaments subulate, connate, with short or long intervening staminodes in a short hypogynous cup; anthers 2-celled. *Ovary* ovoid or subglobose; style simple, long or short, stigma capitellate or stigmas 2; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous utricle or a circumscissile capsule with a coriaceous crown. *Seed* inverse, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear, radicle superior.—Species about 15, in Trop. Asia and Africa.

Spikes axillary and terminal:—

Erect; leaves alternate, flowers dicocious . . . . 1. *Æ. tomentosa*.  
Climbing; leaves alternate and opposite; flowers  
2-sexual . . . . . 2. *Æ. scandens*.

Spikes all axillary; leaves alternate; flowers 1-  
sexual and 2-sexual . . . . . 3. *Æ. lanata*.

1. *Æ. tomentosa*, Forsk. Fl. Egypt.-Arab. cxxii and 727; Fl. Trop. Afr. vi, 37. *Æ. javanica*, Wight; Royle Ill. 320; F. B. I. iv, 727; Watt E. D.; Cooke Fl. Bomb. ii, 493. *Æ. Bovii*, Edgew. in Journ. Linn. Soc. vi, 206. *Achyranthes incana*, Roxb. Fl. Ind. i, 671.—Vern. Chin (Merwara).

A hoary tomentose undershrub, 2-3 ft. high. *Stem* branched, terete, as thick as a goose quill, densely stellate-tomentose. *Leaves* alternate, sessile or nearly so, 1-2½ in. long, linear-oblong or oblong-spathulate, acute obtuse or somewhat retuse, densely tomentose. *Flowers* dicocious, sessile, in densely woolly oblong or linear spikes 1-6 in. long and forming leafless terminal panicles; bracteoles ovate, acute, hyaline. *MALE flowers*: *Perianth* about  $\frac{1}{15}$  in. long. *Sepals* elliptic-oblong, woolly on the back. *Ovary* rudimentary, with short style and bifid,

stigma. FEM. flowers : *Perianth*  $\frac{1}{10}$  in. long. *Sepals* subacute, apiculate. *Stigmas* 2, equaling the style. *Utricle* broadly ovoid. *Seeds* dark-brown and shining.

Abundant in the dry western and south-western portions of the area, also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *DISTRIB.*: Punjab, Rajputana, Sind, Central India and southwards through the W. Peninsula to Ceylon, also in Burma and Baluchistan, extending to Arabia, Trop. Africa and the Cape de Verde Islands. Edgeworth insists that his *Æ. Bovii* is a distinct species. It has much narrower leaves and is sweet-scented, whilst *Æ. javanica*, which grows with it, is not. Bossier regarded it as a variety. I have seen no specimens from the area of this flora.

2. *Æ. scandens*, *Wall. Cat.* 6911; *Royle Ill.* 320; *F. B. I.* iv, 727; *Watt. E. D.*; *Collett Fl. Siml.* 414; *Prain Beng. Pl.* 874; *Cooke Fl. Bomb.* ii, 492. *Achyranthes scandens*, *Roxb. Fl. Ind.* i, 676.

A climbing undershrub with long hoary tomentose branches. *Leaves* alternate and opposite,  $1\frac{1}{2}$ -4 in. long, elliptic-lanceolate or ovate, obtuse or acute and mucronate, glabrous or softly hairy, base tapering into a short petiole. *Flowers* silvery-white, 2-sexual, arranged in ovoid or cylindric axillary and terminal subsessile white-woolly spikes  $\frac{1}{2}$ -1 in. long, the spikes often in pairs and forming a lax terminal panicle; bracteoles shorter than the sepals, ovate, acuminate. *Perianth*  $\frac{1}{10}$  in. long. *Sepals* lanceolate, acuminate. *Utricle* broadly ovate, acute. *Seeds* lenticular, black and shining.

Common in most parts of the area in waste ground, and often found climbing amongst bushes. *DISTRIB.*: Plains of Upper India from the Punjab to Bengal and Assam; outer Himalayan ranges from Kumaon to Bhutan up to 5,000 ft., also in C. and W. India and extending to China, Malay Islands, Philippines and Trop. Africa.

3. *Æ. lanata*, *Juss. in Mus. Par.* ii, 131; *F. B. I.* iv, 728; *Watt E. D.*; *Prain Beng. Pl.* 874; *Cooke Fl. Bomb.* ii, 493. *Achyranthes lanata*, *Linn.*; *Roxb. Fl. Ind.* i, 676.

An erect or prostrate undershrub. *Branches* many from a stout woody rootstock, terete and striate, pubescent or woolly. *Leaves* petioled, alternate,  $\frac{1}{2}$ -1 in. long, those of the branches smaller, elliptic-obovate or suborbicular, obtuse or acute, entire, pubescent above and usually white-woolly beneath. *Flowers* minute, greenish-white, sessile, 1- or 2-sexual, arranged in small dense axillary heads or spikes which are

sometimes crowded into globular clusters ; bracteoles ovate, concave, apiculate. *Perianth*  $\frac{1}{16}$  in. long, oblong, obtuse and often apiculate, silkily hairy on the back. *Utricle ovoid*, acute. *Seeds* black and shining.

An abundant weed over the greater portion of the area. DISTRIB.: Throughout the hotter parts of India and up to 3,000 ft. on the hills ; also in Ceylon, extending to Arabia, Trop. Africa, Java and the Philippines. This plant is in general appearance very similar to, and may easily be mistaken for, *Nothosærva brachiata*. The woolly spikes are often used for stuffing pillows.

*A. MONSONIA*, Mart. ; *F. B. I.* iv, 728 ; *Prain Beng. Pl.* 874 ; *Cooke Fl. Bomb.* ii, 493. *Achyranthes Monsonia*, Pers. ; *Rozb. Fl. Ind.* i, 673.—This species will very probably be found growing within the dry southern border of the area of this flora. It is common in Chota-Nagpur, W. Bengal, in C. and W. India, as well as in Burma. Leaves filiform, in fascicles ; flowers in peduncled spikes, 2-sexual, pale pink ; perianth-segments 4.

#### 6. NOTHOSÆRUA, Wight ; *Fl. Brit. Ind.* iv, 726.

An annual with opposite spreading branches. *Leaves* opposite. *Flowers* very minute, 2-sexual, woolly, arranged in axillary solitary or clustered spikelets, bracteate and 2-bracteolate. *Sepals* 3-5, hyaline, obtuse, 1-nerved. *Stamens* usually 2, free ; anthers 2-celled ; staminodes none. *Ovary* oblong, compressed ; stigma subsessile, capitellate ; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous oblong compressed utricle, enclosed within the perianth. *Seed* inverse, lenticular ; testa crustaceous ; embryo hooked, surrounding floury albumen ; cotyledons linear, radicle superior. A single species, found in Asia and in Trop. Africa.

**N. brachiata**, Wight *Ic.* vi. 1 ; *F. B. I.* iv, 726 ; Watt *E. D.* ; *Cooke Fl. Bomb.* ii, 495. *Pseudanthus brachiatus*, Wight *Ic.* v, t. 1776 (excl. analysis), and *vi*, t. 1776 bis, fig. B.

An erect slender herb, 1-2 ft. high, glabrous or minutely puberulous. *Stem* branched from the base, branches spreading. *Leaves* thinly membranous,  $\frac{3}{4}$ - $1\frac{1}{2}$  in. long, elliptic-lanceolate, acute or subobtuse, tapering to the base ; petiole short or obscure. *Flowers* sessile, glistening-white, crowded in small dense axillary subsessile cylindric

spikes  $\frac{1}{2}$ - $\frac{1}{2}$  in. long; bracts and bracteoles hyaline, acute, persistent. *Perianth*  $\frac{1}{20}$  in. long, villous with silky hairs. *Sepals* acute or subacute, hyaline. *Seeds* minute, black and shining.

Near Saharanpur (Edgeworth), Moradabad (T. Thomson), Oudh (Wallich), Bundelkhand and Merwara (Duthie). DISTRIB.: Punjab Plain, Sind, C. Prov., and south to Mysore and Ceylon; also in Burma, extending to Mauritius and Trop. Africa. This plant is very similar in general appearance to *Ærua lanata*.

7. **ACHYRANTHES**, Linn.; Fl. Brit. Ind. iv, 729.

Herbs, often woody below. Leaves opposite, entire, petioled. Flowers 2-sexual, in slender simple or panicled spikes, soon deflexed; bracts and bracteoles spinescent. *Perianth-segments* 4-5, sepaline, rigid, somewhat connate below, lanceolate, aristate, shining, at length hardened and strongly ribbed. Stamens 2-5; filaments connate at the membranous base, with as many quadrate staminodes, each of which is toothed or has a toothed scale at its back; anthers 2-celled. Ovary oblong, subcompressed; style filiform, stigma capitellate; ovule solitary, pendulous from a long basal funicle. Fruit an oblong or ovoid utricle, areolate or rounded at the apex. Seed inverse, oblong, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear or lanceolate, radicle erect.—Species about 15, in tropical and subtropical regions.

**A. aspera**, Linn. Sp. Pl. 204; Roxb. Fl. Ind. i, 672; Royle Ill, 321; F. B. I. iv, 730; Watt E. D.; Collett Fl. Siml. 414; Prain Beng. Pl. 875; Cooke Fl. Bomb. ii, 495. Vern. Chirchita.

A coarse weed, 1-3 ft. high. Stem erect, simple or slightly branched; branches striate, pubescent. Leaves very variable, up to 5 in. long, elliptic obovate or suborbicular, usually rounded at the apex, tomentose or velvety on both surfaces, rarely glabrate; petioles  $\frac{1}{4}$ - $\frac{3}{4}$  in. long. Flowers many, greenish-white, sharply deflexed against the stout pubescent rhachis of the terminal spikes which elongate in fruit up to as much as 20 in. in length; bracts shorter than the perianth, ovate, acuminate, aristate, persistent; bracteoles about as long as the bracts, ending in a spine which hardens in fruit and remains attached to the fruiting perianth. Perianth  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, glabrous and shining; sepals ovate-oblong, acuminate, white-margined.

*Stamens 5* ; staminodes truncate, fimbriate. *Utricle* oblong, enclosed in the hardened perianth. *Seed* subcylindrical, with a truncate apex, brown.

A very common weed of way-sides and waste places all over the area. **DISTRIB.** : Throughout India and in Ceylon, extending to Trop. Asia, Africa, Australia and America. The plant is used medicinally for various purposes. There appears to be amongst many of the peasant people of N. India a general belief in its efficacy as an antidote for the poison of snakes and scorpions. Colonel Madden mentions that in Oudh the plant is considered to have a paralizing effect on scorpions. The fruit, when ripe, becomes easily detached from the rhachis, carrying with it the hardened persistent perianth to which are attached the spine-like bracteoles.

**S. PUPALIA**, Juss. ; Fl. Brit. Ind. iv, 723.

Herbs or undershrubs. *Leaves* opposite, petioled. *Flowers* fascicled in simple or paniced spikes ; fascicles containing one perfect flower, and several imperfect ones, the perianth-segments of which are reduced to stellately spreading hooked bristles ; bracts and bracteoles scarious ; perianth-segments of perfect flowers 5, slightly connate below, herbaceous, rarely equal, lanceolate, acuminate, 3-5-nerved. *Stamens 5*, filaments slightly connate below, anthers 2-celled, staminodes none. *Ovary* ovoid, style slender, stigma capitellate ; ovule solitary, pendulous from a long basal funicle. *Fruit* an ovoid membranous utricle, enclosed in the perianth, its apex areolate. *Seed* inverse, lenticular, rostellate, testa thinly coriaceous, embryo annular; cotyledons linear, flat, radicle ascending. —Species 5, in Asia and Africa.

**P. lappacea**, Juss. in. Ann. Mus. Par ii, 132 ; F. B. I. iv, 724 ; Prain Beng. Pl. 872 ; Cooke Fl. Bomb. ii, 497.

A large straggling undershrub ; branches terete, tomentose. *Leaves* petioled, membranous, 1½-4 in. long, ovate or elliptic, acute or acuminate, tomentose on both surfaces, ciliate ; base rounded or shortly cuneate ; main nerves many, prominent beneath. *Flowers* in approximate or distant clusters arranged in terminal spikes 4-10 in. long ; rhachis slender, tomentose ; bracts  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovate, acuminate, pungent, villous ; bracteoles  $\frac{1}{2}$  in. long, ovate-oblong, apiculate, concave. *Perianth*  $\frac{1}{2}$  in. long. *Sepals* lanceolate, aristate, 3-nerved, densely white-woolly. *Sterile flowers* reduced to a number of un-

equal glabrous hooked awns, enlarging, stellately spreading, yellowish during the fruiting time and supported during the flowering period by a lanceolate acute 3-nerved aristate bracteole. *Utricle* thinly membranous, oblong and abruptly narrowed to the apex. *Seed*  $\frac{1}{15}$  in. long, ellipsoid, compressed, black and shining.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts eastwards; also in Bundelkhand and Merwara. Flowers towards the end of the rainy season. *DISTRIB.:* Behar, Punjab Plain and up to 3,000 ft. on the W. Himalaya; also in Rajputana, Sind and Deccan Peninsula, extending to S. E. Asia, Trop. Africa and Madagascar.

✓ 9. **ALTERNANTHERA**, Forsk.; *Fl. Brit. Ind.* iv, 731.

Herbs, usually prostrate. *Leaves* opposite. *Flowers* 2-sexual, small, white, in axillary often clustered heads. *Perianth-segments* 5, sepaline, unequal; anterior and 2 posterior flattened; the 2 lateral ones innermost, concave. *Stamens* 2-5; filaments short, connate in a short cup, with or without interposed staminodes; anthers 1-celled. *Ovary* suborbicular or ovoid, style very short, stigma capitellate, rarely 2-fid.; ovule solitary, pendulous from a long basal funicle. *Fruit* a compressed orbicular or obcordate utricle, often with thickened or winged margins. *Seed* inverse, lenticular, testa crustaceous; embryo annular, surrounding the floury albumen, cotyledons narrow, radicle superior.—Species about 16, in tropical and sub-tropical regions, abundant in Australia and America.

*A. sessilis*, R. Br. *Prod.* 417; *Royle Ill.* 320; *F. B. I.* iv, 731; *Watt E. D.*; *Collett Fl. Siml.* 415; *Prain Beng. Pl.* 875. *A. triandra*. Lamk.; *Cooke Fl. Bomb.* ii, 499. *A. prostrata*, Don. *Prod.* 86. *Achyranthes triandra*, Roxb. *Fl. Ind.* i, 678. Vern. *Ghārdughi* (Rohilkhand).

A prostrate herb; branches many, often rooting from the lower nodes, glabrous or the younger ones with 2 opposite lines of hairs. *Leaves* shortly stalked, glabrous and rather fleshy,  $\frac{1}{2}$ -2 in. or more long, linear-oblong lanceolate or elliptic, obtuse or subacute, sometimes subdenticulate. *Flowers* sessile, white and shining, arranged in small axillary sessile heads; bracteoles ovate, scarious. *Perianth*  $\frac{1}{15}$ - $\frac{1}{8}$  in. long. *Sepals* ovate, acute, 1-nerved, scarious. *Ovary* broader than long, compressed. *Utricle* broadly obcordate, margins thickened. *Seed* suborbicular.

Common in all parts of the area in waste places and as a weed of cultivation. DISTRIB.: Throughout India and in Ceylon and up to 4,000 ft. on the Himalaya, extending to all warm countries.

*GOMPHRENA GLOBOSEA*, Linn.; Roxb. *Fl. Ind.* ii, 63; *F. B. I.* iv, 732; Watt *E. D.*; Prain *Beng. Pl.* 876; Cooke *Fl. Bomb.* ii, 499. (The Globe amaranth).—A tall much-branched annual, hairy or subsilky. Leaves shortly stalked, pale-green, 2-4 in. long, elliptic or obovate-oblong. Heads large, globose, terminating the branches, yellowish-white or crimson; bracts leafy; bracteoles pinkish-purple. Sepals densely woolly, shorter than the long staminal tube. Anthers 1-celled. Stigma 2-fid.—Much cultivated in Indian gardens and often met with as an escape. Cultivated in most warm countries, having probably originated in America. It flowers in India during the rainy and cold seasons.

### XCI.—CHENOPODIACEÆ.

Annual or perennial herbs or shrubs. Leaves usually alternate, simple, exstipulate. Flowers small, usually green, 1- or 2-sexual, usually regular, often dimorphic; bracts 1 or none, bracteoles none or 2. Perianth simple, sepaline, of 3-5 free or connate sepals, imbricate, often wanting in female flowers. Stamens usually 5, opposite the perianth-segments, perigynous or hypogynous; filaments free, sometimes with intervening staminodes; anthers 2-celled. Ovary ovoid globose or depressed, 1-celled; style terminal, short or long; stigma capitate or 2-3-lobed; or stigmas 2-5, free or slightly united; ovule solitary, basal or lateral, campylotropous. Fruit a small utricle, rarely a circumscissile capsule, enclosed in the often enlarged fleshy perianth when the latter is present. Seeds erect, inverse or horizontal, crustaceous coriaceous or membranous; albumen floury or fleshy or none; embryo curved, annular or spiral.—Species about 520, widely dispersed throughout the world, and chiefly in saline soils.

Stems not twining; bracteoles free from the perianth; anthers erect or incurved in bud:—

Leaves flat; embryo annular or horseshoe-shaped:—

Fruiting perianth not winged; albumen copious . . . . . 1. CHENOPodium.

Fruiting perianth with transverse wings; albumen scanty . . . . . 2. KOCHIA.

Leaves fleshy,  $\frac{1}{2}$  terete; embryo spiral; albumen none:—

Sepals not winged . . . . . 3. *SUEDA*.

Sepals transversely winged . . . . . 4. *SALSOLA*.

Stems twining to the right; leaves flat, membranous; bracteoles 2, broad, adnate to the face of the perianth; anthers versatile; embryo spiral. 5. *BASELLA*.

**1. CHENOPODIUM**, Linn. ; Fl. Brit. Ind. v, 3.

Annual or perennial erect or prostrate herbs. Leaves alternate, entire lobed or toothed. Flowers minute, 2-sexual, in axillary clusters or cymes; bracts and bracteoles none. Perianth usually 5-lobed; segments concave, incurved. Stamens 5 or fewer, hypogynous or almost perigynous, anthers 2-celled. Disk none or annular. Ovary depressed-globose, rarely ovoid; stigmas 2-5, sometimes united below in a style; ovule solitary, subsessile. Fruit a membranous utricle, enclosed in the perianth. Seed usually horizontal, testa crustaceous or coriaceous, embryo nearly or quite annular, surrounding the floury albumen. Species about 60, in all parts of the world. The fruit of some of the species is dimorphic.

A tall scentless herb; seeds smooth and shining . 1. *C. album*.  
A low rather fœtid herb; seeds rugose, dull-black . 2. *C. murale*.

**1. *C. album***, Linn. Sp. Pl. 219; Roxb. Fl. Ind. ii, 58; F. B. I. v, 3; Duthie Field and Gard. Crops, N. W. Prov. and Oudh, part iii, 21; Watt E. D.; Comm. Prod. Ind. 293; Collett Fl. Siml. 416; Prain Beng. Pl. 878; Cooke Fl. Bomb. ii, 501. *C. giganteum*, Don Prod. 74. *C. viride*, Linn.; Roxb. Fl. Ind. ii, 58. *C. laciniatum*, Linn.; Roxb. I. c. 59. *C. purpurascens*, Buch.-Ham. in Wall. Cat. 6955.—Vern. *Bathu*, *bathu-ság*, *chel* (Merwara). White Goose-foot.

An erect herb, 1-10 ft. or more high, green or more or less coated with white mealy pubescence, inodorous. Stems angled, often tinged with red or purple. Leaves very variable in size and shape, entire toothed or lobed; petioles slender, often equalling or longer than the blade. Flowers in clusters, forming compact or loosely panicled spikes, becoming thyrsoid under cultivation. Sepals  $\frac{1}{10}$ - $\frac{1}{12}$  in. long, oblong-lanceolate, keeled on the back, closely investing the thin membranous utricle. Stigmas 2. Seed  $\frac{1}{15}$  in. in diam. orbicular, compressed and with an acute margin, black and shining.

A very common weed throughout the area especially in cultivated ground and in waste places, very variable. DISTRIB.: Plains of Punjab and Bengal, extending to S. India; also on the Himalaya from Kashmir to Sikkim up to 12,000 ft., and to still higher elevations in W. Tibet; also on the Khasia Hills where it is cultivated. The plant is very rich in potash salts and the leaves are often eaten raw as a salad or cooked as a pot-herb, and on the W. Himalaya it is much grown for its grain. Baden-Powell mentions that in the Punjab this plant is sometimes used in cleaning copper vessels preparatory to tinning them. In *C. viride* the leaves are narrower than in the type and almost entire, and the plant is much less mealy.

**2. *C. murale*, Linn. Sp. Pl. 219; F. B. I. v, 4; Watt E. D.; Cooke Fl. Bomb., ii. 501.**

A subglabrous rather fetid herb. Stem 6-15 in. high, branches erect of ascending. Leaves stalked, bright-green and somewhat shining, 1-3 in. long, rhombic or deltoid-ovate, obtuse or acute, margins irregularly lobed and more or less sharply toothed, entire at the cuneate base. Flowers clustered in lax or dense cymes arranged in axillary racemes or panicles, the terminal leafless panicle much shorter than in *C. album*. Sepals  $\frac{1}{8}$  in. long, oblong, subacute, closing over the utricle, slightly keeled. Stigmas 2. Seeds horizontal, orbicular, compressed, sharply keeled, dull-black, rugose.

Upper Gangetic Plain (T. Thomson), N. W. India (Royle). DISTRIB.: Punjab Plain (Edgeworth, etc.), and on the Himalaya in Kumaon and Nepal; Western and S. India, but Cooke says "scarcely indigenous in the Bombay Presidency"; also in Ceylon, extending to W. Asia, N. Africa and Europe, but introduced in N. America. The plant is used as a pot-herb in the Punjab.

**2. *KOCHIA*, Roth; Fl. Brit. Ind. v, 10.**

Herbs or undershrubs, usually villous or pubescent. Stems slender. Leaves alternate, sessile, narrow, entire. Flowers minute, axillary, solitary or in clusters, 2-sexual and female, rarely only male, ebracteate. Perianth subglobose; lobes 5, coriaceous, incurved and ultimately closing over the utricle, girt by 5 free or confluent wings. Stamens 5, usually exserted; anthers large, ovate. Ovary depressed-globose; style slender, stigmas 2 or 3, capillary. Fruit a depressed membranous utricle. Seed ovoid or

orbicular, horizontal, testa membranous, albumen scanty, embryo annular. Species about 20, in Temp. Asia, N. and S. Africa and in N. W. America.

**K. indica**, Wight Ic. 1791; F. B. I. v. 11; Watt E. D.; Comm. Prod. Ind.; Cooke Fl. Bomb. ii, 503.—Vern. Bui.

A tall erect annual, diffusely branching from the base. Stem and branches white, more or less villous or woolly, striate. Leaves  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, elliptic or linear-lanceolate, acute, hairy on both surfaces, base tapering. Flowers axillary, solitary or in pairs. Perianth about  $\frac{1}{2}$  in. across (when spread out), divided about  $\frac{1}{3}$  of the way down, woolly; segments hooded, mucronate; wings (in fruit) broadly triangular-ovate, scarious. Utricle thinly membranous; stigmas 2, filiform. Seed  $\frac{1}{10}$  in. in diam., orbicular or ovoid, black.

In the neighbourhood of Delhi (F.B.I.). DISTRIB.: Plains of Punjab and Sind, also in the drier parts of S. India, extending to Afghanistan. The plant is sometimes used as fodder for camels.

**3. SUEDA**, Forsk.; Fl. Brit. Ind. v, 13.

Herbs or shrubs. Leaves fleshy, ternate, terete, rarely flattish. Flowers minute, axillary, usually 2-sexual, bracteate and 2-bracteolate. Perianth short, globose or urceolate, 5-lobed or -partite; segments equal or not, simple, gibbous or almost winged. Stamens 5, filaments short, anthers large. Ovary usually sessile, with a wide base, adnate below to the perianth, style none, stigmas 2-5, minute, subulate, recurved. Fruit a small membranous or spongy utricle, included within the perianth. Seed erect, oblique or horizontal, testa crustaceous or coriaceous, albumen scanty or none, embryo slender and somewhat spiral. Species about 40, usually on desert saline tracts and sea-shores.

Perennial; stigmas 3; seed usually erect. . . . 1. *S. fruticosa*.

Annual or occasionally perennial; stigmas 2; seed usually horizontal . . . . . 2. *S. maritima*.

**1. *S. fruticosa***, Forsk. Fl. Egypt.-Arab. 70, t. 9; F. B. I., v. 13; Watt E. D.; Comm. Prod. Ind. 519, Cooke Fl. Bomb. ii, 505. *Salsola Lana*, Edgew. in Hook. Journ. ii, 286.—Vern. Lunak, choti-láni.

A much-branched usually erect shrub. Stem pale, glabrous, branches usually slender. Leaves subsessile, fleshy, very variable,  $\frac{1}{5}$ - $\frac{5}{8}$  in. long,

linear or ellipsoid, obtuse, narrowed to the base, floral leaves shorter. *Flowers* 2-sexual, axillary, solitary or 2 or 3 together, the upper ones forming slender leafy spikes; bracteoles membranous, shorter than the perianth, ovate, acute, entire or denticulate. *Perianth* (in fruit) subglobose, about  $\frac{1}{16}$  in. long; segments thick, oblong, concave, obtuse, incurved. *Utricle* ovoid; stigmas 3, short, spreading. *Seed* erect, obliquely ovoid, beaked, black and shining when ripe.

A common plant in saline soils, and often found as a gregarious bush in the usar tracts of the Upper Gangetic Plain and in Merwara. It flowers during the cold season. *DISTRIB.*: Plains of Punjab and Sind, also in Baluchistan, extending to Africa and the Mediterranean region. The plant is much eaten by camels, and a crude form of *barilla* is prepared from it in Sind.

**2. *S. maritima*, Dumort. Fl. Belg. 22; F. B. I. v, 14; Watt E. D.; Comm. Prod. Ind. 114; Frain Beng. Pl. 878; Cooke Fl. Bomb. ii, 506. *Salsola indica*, Willd.; Roxb. Fl. Ind. ii, 62.—Vern. Láni, khari-láni.**

An erect annual herb or occasionally an undershrub, glaucous-green, Stems  $1\frac{1}{2}$  ft. high, with many slender erect branches. Leaves many,  $\frac{3}{8}$ -1 in. long, fleshy, semiterete, linear or filiform, subacute, floral leaves very small. *Flowers* in small subglobose clusters forming slender lax elongate spikes; bracteoles membranous, ovate, entire. *Perianth* minute; segments rounded, covering the utricle. *Stigmas* 2, slender. *Seed* horizontal, obliquely ovoid or suborbicular, black and shining.

In the neighbourhood of Delhi (C. B. Clarke), also on the usar tracts in the Upper Gangetic Plain (Duthie). Flowers during the hot season. *DISTRIB.*: Sea-coast of Bengal and Bombay and in S. India and Ceylon, extending to Siam, N. and W. Asia, N. Africa, Europe and N. America. The leaves, which are quite wholesome, are eaten by the poorer classes in times of scarcity.

**4. *SALSOLA*, Linn.; Fl. Brit. Ind. v, 17.**

Herbs or shrubs, branches not jointed. *Leaves* usually alternate, sessile and often amplexicaul, sometimes with pungent tips. *Flowers* small, axillary, solitary or fascicled, bracteoles 2. *Perianth* 5 (rarely 4)-partite; segments concave, accrescent in fruit, usually furnished with a broad scarious horizontal wing above the middle and completely embracing the utricle. *Stamens* 5 or fewer, usually

hypogynous. *Fruit* an ovoid or orbicular fleshy or membranous utricle; stigmas 2 or 3, subulate or linear. *Seed* usually horizontal, testa membranous, albumen none, embryo spiral.—Species about 40, in Temp. Asia, Australia and N. America.

**S. festida**, *Del. Fl. Ægypt. Ill.* (1812) *n. 310*; *F. B. I. v.*, 18; *Watt E. D.*; *Comm. Prod. Ind.* 114; *Gamb. Man.* 552; *Brand. Ind. Trees* 519; *Cooke Fl. Bomb. ii.*, 507. *S. indica*, *Herb. Royle*.—*Vern. Lána, shora, gora-lána*.

A large much-branched hoary shrub up to 4 ft. or more in height. *Stem* stout; branches densely crowded, slender. *Leaves* minute, sub-globose, fleshy; the floral ones imbricate and forming very short cylindric spikes; bracteoles fleshy,  $\frac{1}{20}$  in. long, broadly ovate or orbicular. *Perianth* silvery-white, not exceeding the bracteoles, oblong, obtuse; wings symmetrical, rounded, membranous and transparent, margins often overlapping. *Stigmas* 2, large, recurved.

Found in the districts of Delhi and Agra (Royle, Munro, etc.). Flowers in the cold season. *DISTRIB.*: Plains of Punjab and Sind; also in Baluchistan, Afghanistan, and westwards to Persia, Arabia and N. Africa. This plant is much used in the preparation of *barilla* (carbonate of soda). The branchlets often bear globose villous galls  $1\frac{1}{4}$  in. in diam.; these latter are covered by linear leaves somewhat resembling the involure of a composite. The plant is described as having a strong odour of rotten fish. It is eaten greedily by camels.

##### 5. **BASELLA**, Linn.; *Fl. Brit. Ind. v.*, 20.

Much-branched twining fleshy herbs. *Leaves* alternate, broad, entire. *Flowers* in spikes, 2-sexual, white, red or violet; bracts minute, caducous; bracteoles 2, united into a 2-lipped cup and adnate to the perianth. *Perianth* fleshy, 5-fid.; at length berry-like; lobes short, incurved. *Stamens* 5, on the mouth of the perianth-tube; filaments short, erect in bud; anthers versatile, globose. *Styles* 3, stigmas 2, linear-clavate, papillose on the inner side, ovule sessile. *Fruit* a globose utricle, included within the fleshy perianth; pericarp thin, adnate to the seed. *Seed* erect, sub-globose, testa crustaceous, albumen scanty, embryo plano-spiral; cotyledons large, thin, involute.—Species 2, in Asia and Trop. Africa, elsewhere cultivated in the tropics.

**B. rubra**, Linn. Sp. Pl. 272; F. B. I. v, 20; Watt E. D.; Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii, 19; Prain Beng. Pl. 882; Cooke Fl. Bomb. ii, 509. **B. alba**, Linn.; Roxb. Fl. Ind. ii, 104.—Vern. *Poi, lál-bachlu*. (Indian Spinach.)

A glabrous fleshy perennial much-branched climbing herb, often tinged with red. Leaves 2-5 in. long or more, broadly ovate, acute or acuminate, thick, entire, often cordate at the base; petioles  $\frac{1}{2}$ -1 in. long. Flowers sessile, white or red, in lax axillary peduncled spikes 1-6 in. long; bracts apiculate, bracteoles longer than the perianth, oblong, obtuse. Perianth remaining closed, divided half-way down; lobes elliptic, obtuse. Utricle red white or black, about the size of a pea.

Wild and cultivated within the area. It flowers during the cold season  
 DISTRIB.: Throughout the hotter portions of India and in Ceylon extending to other parts of Trop. Asia and to Trop. Africa. Roxburgh describes five varieties in Bengal, 2 of them wild and 3 cultivated; also a further kind (*B. lucida*, L. and *B. cordifolia* Lamk.). This latter is a much larger and more succulent plant, and is the one chiefly grown in Bengal for use as a pot-herb. It is usually raised from cuttings and planted so as to climb over the roofs of native houses and on trellises, where it affords both shade and food.

The following cultivated species belonging to genera which are not indigenous within the area of this flora should be mentioned:—

**BETA VULGARIS**, Linn.; F. B. I. v, 5; Watt E. D.; DC. L'Orig. Pl. Cult. 46; Duthie Field and Gard. Crops, part iii, 19; Prain Beng. Pl. 879; Cooke Fl. Bomb. ii, 509. **B. benghalensis**, Roxb. Fl. Ind. iii, 59.—Vern *Chukandar, paldák, palang*. (Garden beet). Extensively grown in India for its root, which is used chiefly by Europeans as a salad. *B. benghalensis* is a form with more erect branches. It is much cultivated by the natives of N. India for the sake of its leaves which are eaten as a vegetable. *B. maritima* L., from which the beet and the mangold-wurzel are supposed by some to have originated, has decumbent branches. The genus *Beta* differs from *Chenopodium* in the presence of both bracts and bracteoles, and by the perianth becoming thickened and hard at the base.

**SPINACIA OLERACEA**, Linn.; F. B. I. v, 6; Watt E. D.; DC. L'Orig. Pl. Cult. 78; Prain Beng. Pl. 880; Cooke Fl. Bomb. ii, 509. **S. tetrandra**, Roxb. Fl. Ind. iii, 771; Royle Ill. 318.—Vern. *Palák* (Spinach). This plant is largely grown in Indian native gardens,

and is much used as a pot-herb. Its original habitat as a wild plant is not known. It differs from the Genus *Chenopodium* in having 1-sexual flowers, the males being crowded in terminal leafless spikes and the females arranged in axillary clusters.

*ATRIPLEX HORTENSIS*, Linn.; *F. B. I. v. 6*; *Watt E. D.*; *Prain Beng. Pl. 380*; *Cooke Fl. Bomb.*, *ii*, 502.—An erect succulent annual, often tinged with red or purple. The flowers are 1-sexual or polygamodioecious. The female flowers have no perianth, its place being taken by 2 bracteoles which become dilated and form a 2-valved covering to the utricle. The plant is extensively cultivated as a pot-herb in the plains of Upper India, as well as on the Himalaya up to 12,000 ft. In Europe it is often grown as a vegetable under the name of "Orache" or "Mountain Spinach." The origin of this species is not known for certain.

*A. NUMMULARIA*, Lindl. is an Australian shrub known in that country as the "Salt bush." It is much valued as affording good fodder for sheep in the drought-affected areas, where it is able to hold its own during very dry seasons when nearly all other vegetation disappears. For this reason it was introduced into India about twenty years ago by the writer in order to test its value as a reclamation plant on the *usar* tracts of the Upper Gangetic Plain. The results, however, proved to be unsatisfactory owing to the excessive moisture in that portion of India during the hot rainy season.

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## XCII.—POLYGONACEÆ.

Herbs or shrubs, very rarely trees. Leaves usually alternate, entire or sometimes serrulate; stipules scarious or membranous, usually sheathing the stem. Flowers small or medium-sized, regular, usually 2-sexual, solitary or in axillary cymose clusters, pedicels usually jointed. Perianth inferior, simple; segments 3-6, free or connate, imbricate in bud. Stamens 5-8, rarely more or fewer, opposite the perianth-segments. Disk annular, glandular or none. Ovary free, sessile, 1-celled; styles 3 or 2, rarely 4, free or connate; stigmas capitate, peltate or fimbriate; ovule solitary, orthotropous, sessile or on a distinct funicle. Fruit a small hard nut, compressed or 3-gonous, rarely 4-gonous, enclosed in the persistent perianth.

*Seed* erect, testa membranous, albumen floury, sometimes ruminant. Species about 600, chiefly in temperate regions.

Perianth 4-5 (rarely 3)-cleft; stigmas capitellate;  
fruit a compressed or 3-gonous nutlet . . . . . 1. POLYGONUM.  
Perianth 6-cleft, the 3 inner segments much enlarged in fruit; stigmas fimbriate; fruit a small 3-questrous nutlet . . . . . 2. RUMEX.

1. **POLYGONUM**, Linn. ; Fl. Brit. Ind. v, 23.

Herbs or shrubs, rarely climbing. *Leaves* alternate, entire, rarely toothed lobed; stipules tubular, membranous. *Flowers* 2-sexual, small or minute, axillary or terminal, clustered, the clusters sessile or in spiciform capitate or panicled racemes; pedicels short, usually jointed under the perianth, bracts and bracteoles membranous, ochreate. *Perianth* green or coloured, 4-5 (rarely 3)-cleft, the 2 outer lobes usually smallest. *Stamens* 5-8 (rarely 1-4), perigynous; filaments often dilated at the base or alternate with the lobes of an annular or glandular disk. *Ovary* compressed or 3-gonous; styles 2 or 3, free or slightly connate, stigmas usually capitellate. *Fruit* a compressed or 3-gonous nutlet, covered or partially so by the persistent perianth; pericarp usually hard and often shining. *Seed* with the embryo lateral or excentric, radicle long, cotyledons small.—Species about 150, throughout the world, but chiefly in temperate regions.

Of the 79 species now known to occur within the area of British India, 45 are restricted to the Himalayan and the North-West Frontier regions; and of the remaining 34 species, fourteen are here included as inhabiting the Upper Gangetic Plain. The very useful "Census of the Indian Polygonums" prepared by Major Gage in 1903 as a contribution to Vol. II of the "Records of the Botanical Survey of India" has been freely made use of by the present writer.

Inflorescence in axillary clusters.—Annual or perennial herbs with small leaves and hyaline stipules . . . . . 1. *P. plebejum* and vars.

Inflorescence terminal, racemose spicate or capitate :—

Inflorescence in elongate stout or filiform racemes or spikes :—

Nutlets biconvex :—

Bracts hairy :—

Bracts coarsely hairy or strigose :—

Leaves ovate, petioles 1-4 in. long . . . . . 2. *P. orientale*.

Leaves lanceolate, petioles less than  $\frac{1}{2}$  in. long . . . . . 3. *P. limbatum*.

Bracts densely hirsute-woolly . . . . . 4. *P. lanigerum*.

Bracts glabrous :—

Perianth not glandular, ochreæ usually eciliate . . . . . 5. *P. glabrum*.

Perianth glandular, ochreæ shortly ciliate . . . . . 6. *P. lapathifolium*.

Nutlets trigonous :—

Racemes stout and short, with closely imbricate bracts, perianth not glandular :—

Bracts more or less hairy . . . . . 7. *P. stagninum*.

Bracts glabrous :—

Leaves tapering to the acute base, marginal cilia of ochreæ longer than the tube . . . . . 8. *P. barbatum*.

Leaves tapering to a rounded or subcordate base, marginal cilia of ochreæ not longer than the tube . . . . . 9. *P. serrulatum*.

Racemes slender, filiform, bracts more or less distant :—

Perianth glandular; stems shortly creeping below; nutlets not polished :—

Ochreæ very shortly ciliate or eciliate; bracts glandular or not . . . . . 10. *P. Hydropiper*.

Ochreæ with cilia at least half as long as the tube; bracts always glandular . . . . . 11. *P. flaccidum*.

Perianth not glandular, very small; stems extensively creeping below; nutlets polished . . . . . 12. *P. Posumbu*.

Inflorescence capitate, compressed :—

Heads with an involucral leaf at the base . . . . . 13. *P. alatum*.  
 Heads without an involucral leaf at the base . . . . . 14. *P. capitatum*.

1. *P. plebejum*, R. Br. Prod. 420; F. B. I. v, 27: Watt E. D.; Collett Fl. Siml. 421; Gage in Rec. Bot. Surv. Ind. ii, 383; Prain Beng. Pl. 885; Cooke Fl. Bomb. ii, 512. *P. aviculare*, Don Prod. 72 (not of Linn.). *P. herniarioides*, Del.; Royle Ill. 313.

A prostrate diffusely branched herb, often with a woody rootstock; branches stout or slender, terete, striate, glabrous; lower internodes often longer than the leaves, upper shorter or very short. Leaves sessile or shortly stalked,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, oblong or linear or obovate; stipules hyaline, rather short, lacerate to the middle and fimbriate, nerves usually obscure. Flowers axillary, solitary or 2-3-nate, sessile or nearly so. Perianth pink, about  $\frac{1}{10}$  in. long, divided nearly to the base; segments short, broad, rounded or the 2 outer ones acute. Nutlets 3-gonous, shining.

Throughout Trop. India, ascending to 6,000 ft. on the Himalaya from Bhutan to Kashmir, but not in Ceylon. Beyond India it extends to Afghanistan, Egypt, Trop. and S. Africa, Madagascar, Java, Philippines, and Australia. Regarding this very variable species Sir Joseph Hooker remarks that, if he was right in bringing all the ten varieties (or forms) described by him in the Fl. Brit. India under one species, this is a far more protean plant than *P. aviculare* with which it is generally compared, but from which it differs entirely in habit, in the usually few-nerved stipules and in the rhombic smooth nutlet. *P. aviculare* is abundant on the W. Himalaya and in W. Tibet. Major Gage, after a careful and detailed examination of the many specimens included in the Calcutta Herbarium, as forms or varieties of *P. plebejum*, enumerates 8 varieties in his census. At the same time he is very much inclined to regard them as representing 4 distinct species, and that they might be grouped as follows :—

$I \left\{ \begin{array}{l} \text{plebejum (proper).} \\ \text{effusa.} \\ \text{elegans.} \\ \text{micranthema.} \end{array} \right.$	$II \left\{ \begin{array}{l} \text{indica.} \\ \text{brevifolia.} \end{array} \right.$
	$III. \text{ Griffithii.}$
	$IV. \text{ polyneura.}$

He draws attention also to the fact that, apart from morphological considerations, the altitudinal distribution of the constituents, as given in his census, tends to support this view. Of the eight varieties therein mentioned, and which may be regarded for the present as belonging to a single species, all except *polyneura* appear to have been recorded as growing within the limits of this flora. The descriptions are mainly Hooker's, taken from the Fl. Brit. India.

VAR. 1. *PLEBEJUM* (proper).—Branches stout or slender. Lower internodes often longer than the leaves, upper shorter or very short. *Leaves*  $1\frac{1}{2}$  in. long; upper often much shorter, oblong or linear, obtuse, margins often recurved. *Flowers* sunk amongst the stipules, rarely exserted. *Sepals* short, broad, rounded.—Dehra Dun, Lucknow, Bundelkhand. *DISTRIB.* Common from Assam to N. W. India and on the outer Himalayan ranges; found also in N. Kanara and extending to Africa and Australia.

VAR. 2. *EFFUSA*.—A slender rather flaccid plant with long internodes. *Leaves* narrowly linear or widening upwards from a very narrow base, tip rounded. *Flowers* all or mostly pedicelled. *Sepals* short, broad.—Dehra Dun (King), N. W. India (Royle), Merwara (Duthie). *DISTRIB.*: Bengal to Bombay and Sind. *P. effusum*, Meissn. Herb. Strach. and Winterb. No. 22. Usually in wet places.

VAR. 3. *ELEGANS*.—Black when dry. Branches stout, grooved, smooth or scaberulous; internodes longer or shorter than the leaves. *Leaves*  $1\frac{1}{2}$  in. long; upper as long as the lower, linear-lanceolate, acute or acuminate, rarely obtuse, margins flat or revolute; stipules fimbriate, brownish. *Flowers* sessile or shortly pedicelled. *Sepals* narrow, the two outer acute.—Sub-Himalayan tracts of Rohilkhand and N. Oudh (Wallich, Duthie), Saugor (Vicary). *DISTRIB.*: Bengal, Nepal, Assam and Tenasserim, extending to Australia. *P. elegans*, Roxb.; Fl. Ind. ii, 291. Hooker describes this as a large form passing into *plebejum* (proper) by insensible transitions. It is also *P. prostratum* of Roxb. l.c.

VAR. 4. *MICRANTHEMA*.—A small plant with slender branches. *Leaves*  $1\frac{1}{2}$  in. long, linear or linear-oblong, obtuse at the apex and narrowed towards the base; upper crowded, as long as the often distant lower, stipules short. *Flowers* very minute, pedicelled, crowded in the upper axils. *Sepals* narrow, obtuse. *Nutlets* minute,  $\frac{1}{10}$  in. in diam.—Dehra Dun (King), Siwalik range and N. Oudh (Duthie). *DISTRIB.*: Bengal in sandy river beds, also in Sind. Hooker regards this as only a small state of *P. plebejum*, into which it passes by in

sensible gradations. Cooke Fl. Bomb. ii, 514. *P. micranthum* Franchet.

VAR. 5. INDICA.—Branches uniformly spreading all round from the crown and leafy, internodes short. Leaves  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, linear or obovate-oblong, flat, obtuse or apiculate; stipules very short. Flowers crowded in the axils, pedicels shorter than the perianth or none. Sepals broad, 2 outer acute. Nutlets  $\frac{1}{4}$  in.—Saugor (Jerdon). DISTRIB.: Common in Central and S. India, also in the Bombay Pres., extending to Africa and Australia. Watt E. D.; Cooke Fl. Bomb. ii, 513. *P. indicum*, Heyne.

VAR. 6. BREVIFOLIA.—Rootstock woody; branches stout, often 1-2 ft. long, dark-brown, grooved; internodes of branchlets very short, concealed by the leaves and stipules which latter show as a continuous white villous band on the underside of the branchlets. Leaves  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, obovate, acute or apiculate, flat, coriaceous, dark-brown when dry. Flowers sessile, almost concealed by the stipules. Sepals narrow, outer acute. Nutlets  $\frac{1}{4}$ - $\frac{1}{2}$  in.—Abundant within the area in dry places. DISTRIB.: Bengal to Garhwal and W. India, also in Burma and extending to Africa. Prain Beng. Pl. 886; Cooke Fl. Bomb. ii, 514. A short form with crowded leaves; allied to *indica*, and differing from *Griffithii* by its stout habit and narrower longer leaves which are less covered by the stipules.

VAR. 7. GRIFFITHII.—Branches excessively numerous from the root, very slender flexuous and quite naked below; branchlets with the internodes so close that they look woolly from the crowded and imbricate stipules. Leaves shorter than the almost nerveless stipules, orbicular or broadly obovate, flat, apiculate. Flowers minute, subsessile, hidden amongst the stipules. Sepals rounded, the 2 outer apiculate.—N. W. India (Falc.); abundant in the Jumna and Chambal ravines of Agra and Etawah (Duthie), and in Bundelkhand (Duthie) and Saugor (Jerdon). This very distinct-looking plant is considered by Hooker to be probably a modified form of *brevifolia* with the bases of the branches buried in soil and hence almost leafless and very slender.

2. *P. orientale*, Linn. Sp. Pl. 362; F. B. I. v, 30; Collett Fl. Siml. 421; Prain Beng. Pl. 886; Gage in Rec. Bot. Surv. Ind. ii, 386; *P. pilosum*, Roxb. Fl. Ind. ii, 286.

A tall erect branching annual, 3-10 ft. high, usually softly pubescent or silkily villous; stems robust, grooved, branches hollow. Leaves 6-9 in. long, ovate or ovate-cordate, acuminate; petioles 1-4 in. long, stipules short, truncate, hirsute, ciliate at the mouth, expanded or

tightly embracing the stem. *Racemes* laxly panicled, cylindric, 3-5 in. long, peduncles stout, erect or drooping; bracts crowded, 3-6-flowered, strigosely tomentose and ciliate. *Flowers* large; perianth white red or green, 4 or 5 partite. *Stamens* 7-8, included. *Styles* connate below, stigmas capitellate. *Nutlets*  $\frac{1}{8}$  in. long, orbicular, compressed, with rounded margins and rather concave faces, black and shining when ripe.

Dehra Dun, in swamps (Falconer, Duthie); Sub-Himalayan tracts of N. Oudh. Flowers during the rainy season. *DISTRIB.*: Himalaya eastwards from Kashmir, ascending to 5,000 ft.; also in Bengal, Assam and Burma; extending to Turkestan, Siam, China, Japan, Java and Borneo. The plant is often cultivated, and in that condition it often becomes almost glabrous.

3. *P. limbatum*, Meissn. in DC. *Prod.* xiv, 123; *F. B. I.* v, 30; *Prain Beng. Pl.* 886; *Gage in Rec. Bot. Surv. Ind. ii*, 387; *Cooke Fl. Bomb. ii*, 515.

Annual. Stem simple, very stout, erect or prostrate below, pubescent or glabrous. *Leaves* shortly petioled, 4-8 in. long, lanceolate, acuminate, tapering below, scaberulous on both surfaces; stipules cylindric, strigose; mouth truncate, with a spreading or recurved scabrid and ciliate herbaceous limb. *Flowers* in short erect panicled racemes, peduncles strigose; bracts crowded, hispid. *Nutlets*  $\frac{1}{8}$  in. in diam., orbicular, compressed, margins rounded, faces convex.

Saharanpur, Rohilkhand (T. Thomson), N. Oudh (R. Thompson), Bundelkhand (Vicary), Saugor (Jerdon); usually in wet ground. *DISTRIB.*: Garhwal, Bengal, W. and S. India; extending to Egypt and Trop. Africa.

4. *P. lanigerum*, R. Br. *Prod.* 419; *Royle Ill.* 313; *F. B. I.* v, 35; *Prain Beng. Pl.* 886; *Gage l. c.* 394. *P. lanatum*, Roxb. *Fl. Ind. ii*, 285.

A robust annual (or perhaps sometimes perennial), 2-5 ft. high. Stem stout, prostrate below and rooting at the nodes, clothed with snow-white tomentum; branches slender, deep-red within especially at the nodes. *Leaves* shortly stalked, narrowly lanceolate, acuminate, densely white-cottony beneath; stipules membranous, striate; mouth unequally truncate, sparsely ciliate. *Racemes* slender, 1-2 in. long; peduncles spreading, white-tomentose; bracts small, crowded, densely white-woolly. *Perianth* small, white or pink, glandular. *Stamens* 6. *Style* 2-cleft. *Nutlets* small, orbicular, black and shining.

In ditches and wet places, chiefly in the northern portion of the area, from Dehra Dun eastwards along the Sub-Himalayan tracts. *Flowers* during the rainy season. *DISTRIB.* : Rajputana, and on the outer Himalayan ranges from the Punjab to Sikkim, ascending to 5,000 ft. in Garhwal and Kumaon; also in Bengal, Assam and Burma; and extending to China, Java, the Philippines, Egypt, Trop. and S. Africa, America and N. Australia.

5. *P. glabrum*, Willd. *Sp. Pl. ii*, 447; *Roxb. Fl. Ind. ii*, 287; *Royle Ill. 313*; *F. B. I. v*, 34; *Watt E. D.*; *Collett Fl. Siml. 422*; *Prain Beng. Pl. 886*; *Gage l. c. 393*; *Cooke Fl. Bomb. ii*, 514.

An erect glabrous annual, 2-5 ft. high. *Stems* stout, simple or slightly branched, procumbent below and usually tinged with red. *Leaves* 3-9 in. long, lanceolate, acuminate, tapering at the base, glabrous and usually gland-dotted, lateral nerves close; *petioles*  $\frac{1}{2}$ - $\frac{1}{2}$  in.; *stipules* 1- $\frac{1}{2}$  in. long, closely embracing the stems when young, veins conspicuous, mouth truncate, ciliolate. *Racemes* erect, slender, 2-4 in. long, forming a terminal panicle, peduncles usually glabrous; *bracts* glabrous,  $\frac{1}{4}$  in. long, ovate, obtuse; margins membranous, rarely ciliolate. *Perianth*  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, pink or white, not glandular; segments ovate-oblong, obtuse. *Stamens* 6-8. *Styles* 2, rarely 3, connate below. *Nutlets*  $\frac{1}{8}$  in. in diam., sub-orbicular and biconvex, or 3-angled in the 3-styled flowers.

Abundant in all parts of the area in swamps and by streams. *DISTRIB.* : Throughout the greater part of India in wet places, ascending to 6,000 ft. on the Himalaya, also in Ceylon. It is found also in China, Australia, Africa and America. Hooker (in F.B.I., l. c.) notes that it is difficult to separate this species from smooth forms of *P. Persicaria*, of which it may be regarded as the tropical representative in India. It is, however, as he says, a much larger plant, less branched and with more attenuate leaves, which turn brown when drying; also in normal specimens the stipules and bracts are ciliolate. The pungent leaves and young shoots are cooked by the natives in certain parts of India and eaten as an adjunct to other vegetables.

6. *P. lapathifolium*, Linn. *Sp. Pl. 360*; *F. B. I. v*, 35 (var. *laxa*); *Gage l. c. 395*; *Prain Beng. Pl. 886*; *Duthie in Strachey Cat. Pl. Kumaon (1906) 258*. *P. laxum*, Reichb. *P. nutans*, Roxb. *Fl. Ind. ii*, 285. *P. simlense*, Royle ex Bab. in *Trans. Linn. Soc. xviii (1841)*, 102; *Collett Fl. Siml. 422* (in part). *P. quadrifidum*, Herb. *S. and W. No. 24*.

An erect branching usually pale-green annual. *Stems* often tinged with red. *Leaves* sub sessile, elliptic-ovate or lanceolate, glandular beneath; stipules usually shortly ciliate. *Racemes* erect or nodding, dense or (in Indian specimens) rather lax; bracts ciliolate, peduncles and pedicels glandular. *Perianth* greenish, glandular, nerved strong. *Stamens* usually 6. *Nutlets* orbicular, biconvex.

Collected by Dr. T. Thomson in the Moradabad District. This is the only authentic record I have seen of its occurrence within the area of this flora, though doubtless existing in other localities. *DISTRIB.* : From Bengal to the N. W. Frontier, ascending to 5,000 ft. on the Himalaya; also in Assam and Burma. This is the var. *laxa* of the Fl. Brit. Ind., distinguished from the type by its cylindric and more lax racemes.

**7. *P. stagninum*,** *Buch.-Ham. ex Meissn. in Wall. Pl. As. Rar. iii, 56; F. B. I. v, 37; Prain Beng. Pl. 887; Gage in Rec. Bot. Surv. Ind. ii, 397.*

A simple or branched annual. *Stems* erect or ascending, eglandular. *Leaves* 3-5 in. long, lanceolate or linear-lanceolate, strigosely pubescent on both surfaces, often glandular beneath, usually silky when young, turning grey when dry; stipules strigose, cilia shorter than the tube. *Racemes* erect, many-flowered; peduncles usually long and stout, sub-silky strigose; bracts close, more or less hairy and ciliate on the margins. *Perianth* white, eglandular. *Styles* long connate below. *Nutlets* 3-gonous, pitchy black.

In wet places in the Sub-Himalayan tracts from Dehra Dun to N. Oudh. *DISTRIB.* : Himalayan outer ranges from the Punjab to Sikkim; also in Bengal, Assam and Burma. This plant is so closely related to *P. barbatum* that, apart from certain differences in regard to pubescence, characters which are not invariably constant, the two might well be united under one species, treating *P. stagninum* as a variety of *P. barbatum*, as already suggested by Sir Joseph Hooker and Major Gage.

**8. *P. barbatum*, Linn. Sp. Pl. 362; Royle Ill. 313; F. B. I. v, 37; Watt E. D.; Prain Beng. Pl. 887; Gage l. c. 397. *P. rivulare*, Koen.; Roxb. Fl. Ind. ii, 290.**

A stout annual. *Stems* erect, glabrous or nearly so. *Leaves* 4-7 in. long, lanceolate or linear-lanceolate, acuminate, tapering to the acute base, glabrous except the ciliolate margins and midrib beneath; stipules strigose, the mouth with cilia which exceed the length of the tube.

Peduncles quite glabrous. *Racemes* erect, slender, weak, 2-4 in. long; bracts crowded, glabrous, margins sparingly and shortly ciliate. *Perianth* white, eglandular. *Stamens* 5-8. *Styles* 3-cleft. *Nutlets* trigonous.

Common within the area usually in wet places. DISTRIB.: Hotter parts of India from Assam and Bengal to the N. W. Frontier, and from the Cent. Prov. to S. India and Ceylon; also in Burma extending to the Malay Peninsula, China, Japan, Trop. Africa and Australia. This species differs from *P. serrulatum* by the acute base of the leaves and by the much longer bristles of the stipules; the leaves also turn brown when drying. Watt mentions that in China and Japan this plant yields a blue dye similar to that of indigo.

**9. *P. serrulatum*, Lagasc. Gen. and Sp. Pl. 14; F. B. I. v, 38;** *Prain Beng. Pl. 887*; *Gage l. c. 399*; *Cooke Fl. Bomb. ii, 515.* *P. flaccidum*, *Roxb. Fl. Ind. ii, 291* (not of *Meissn.* or *Boiss.*).—Vern. Pánimirch.

An annual. *Stems* prostrate and rooting below; branches 2-4 ft. high, glabrous, often reddish. *Leaves* subsessile, drying green, 2-5 in. long, linear or elliptic-oblong, acute or acuminate, glabrous or sparsely hairy on upper surface and midrib; base rounded or cordate; stipules strigose; mouth truncate, with bristles on the margin nearly as long as the tube. *Racemes* panicled, slender, erect,  $\frac{1}{2}$ -2 in. long; bracts glabrous, strongly and often squarrosely ciliate. *Perianth* white,  $\frac{1}{16}$  in. long, eglandular. *Stamens* 5-8. *Styles* 3, connate below. *Nutlets* trigonous,  $\frac{1}{16}$  in. long, polished.

Common within the area in swamps and by river-banks. DISTRIB.: From Assam and Bengal to the Indus, ascending to 7,000 ft. on the W. Himalaya; also in Central and S. India and in Ceylon; extending to Burma, China, the Malay Pen., W. Asia, S. Eur., Africa, America and Australia.

**10. *P. Hydropiper*, Linn. Sp. Pl. 361; Royle Ill. 317; F. B. I. v, 39; Watt E. D.; Collett Fl. Siml. 423; Prain Beng. Pl. 887; Gage l. c. 401.—Water-pepper.**

A rather robust glabrous annual. *Stems* much-branched, minutely glandular, 12-18 in. high, swollen at the joints, prostrate and rooting at the lower nodes. *Leaves* shortly stalked, rarely more than 3 in. long, lanceolate or oblong-lanceolate, variable in width and in the length of the apical portion, usually covered with impressed glands glabrous or with the midrib scabrid beneath; stipules glabrous or

sparsely strigose with hairs that are sunk in the tissue, very shortly ciliate or eciliate. *Racemes* decurved, filiform, flexuous, leafy at the base; bracts more or less interrupted, glabrous, glandular or not; mouth naked or minutely ciliate. *Perianth* pink, very glandular. *Nutlets* usually trigonous, opaque, granulate.

In wet places, chiefly in the northern portion of the area, from Dehra Dun and Rohilkhand eastwards. *DISTRIB.* : From Assam and Bengal to the N. W. Frontier, ascending to 7,000 ft. on the Himalaya, also on the Khasia Hills; extending to Europe, N. Africa, Java, N. America and Australia. The fresh plant contains an acrid juice, which is used as a powerful diuretic.

**11. *P. flaccidum*.** *Meissn.* in *DC. Prod. xiv*, 107 in part, excl. *syn.* (not of Roxburgh); *F. B. I. v*, 39; *Prain Beng. Pl.* 887; *Gage l. c.* 402. *P. tenellum*. *Roxb. Fl. Ind. ii*, 289.

A glabrous or pubescent annual or perennial. *Root* shortly creeping. *Stems* 2-3 ft. high, slender, shortly creeping below, simple or branched. *Leaves* usually stalked, 2-6 in. long, lanceolate or elliptic-lanceolate, acuminate, quite glabrous except sometimes on the midrib and nerves beneath, or strigosely hairy beneath or on both surfaces, more or less glandular, brown when dry; stipules strigose or hirsute, marginal cilia half as long as the tube or longer. *Racemes* subpanicle, sometimes 6 in. long and very slender; bracts usually very distant, glabrous or more or less ciliate, glandular or not. *Perianth* bright-pink or white (Roxburgh) closely glandular. *Stamens* 8. *Nutlets* small, trigonous, dull-black, minutely rugose.

In wet ground, Upper Gangetic Plain (T. Thomson), Dehra Dun (King). Flowers during the rainy season. *DISTRIB.* : Throughout India in wet places, ascending to 6,000 ft. on the Kumaon Himalaya; also in Ceylon, Malay Pen. and Islands and China.

**12. *P. Posumbo*,** *Buch.-Ham. in Don. Prod. 71* (not of Wallich); *F. B. I. v*, 38; *Gage l. c.* 425.

A very slender flaccid perennial herb. *Stems* extensively creeping then ascending or decumbent. *Leaves* petioled, membranous, 1-3 in. long, elliptic-lanceolate, caudate-acuminate, glabrous or sparsely hairy; stipules slightly strigose; cilia stiff, longer than the tube. *Racemes* erect, filiform, 1-3 in. or longer; bracts minute, imbricate or distant, very shortly ciliate. *Perianth* very small, eglandular. *Nutlets* smooth and polished.

Dehra Dun (King). DISTRIB.: Sub-tropical and temperate Himalaya from Kashmir to Sikkim ascending to 9,000 ft.; also in Assam and on the Khasia Hills, extending to Java, China and Japan.

13. *P. alatum*, *Buch.-Ham. in Don. Prod. 72*; *F. B. I. v.*, 41<sup>1</sup>; *Watt E. D.*; *Prain Beng. Pl. 887*; *Collett Fl. Siml. 423* (in part); *Gage l. c. 404*; *Cooke Fl. Bomb. ii*, 516. *P. punctatum*, *Buch.-Ham. l. c.*; *Trimen Fl. Ceyl. iii*, 413. *P. nepalense*, *Meissn.*

A procumbent glabrous or sparsely hairy annual. *Stems* 1-2 ft. long, rooting at the nodes; branches many, ascending. *Leaves*  $\frac{1}{4}$ - $1\frac{1}{2}$  in. long, deltoid-ovate, acute or subobtuse, entire, minutely punctate; base subtruncate or subcordate, shortly cuneate; petioles winged, amplexicaul at the base; stipules membranous, obliquely truncate, eciliate but with a tuft of hairs at the base. *Flowers* in compressed peduncled heads, with an involucral leaf at the base of each head; peduncles glandular-hairy above; bracts membranous,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, eciliate. *Perianth*  $\frac{1}{2}$  in. long, 4 fid. *Nutlets*  $\frac{1}{16}$  in. long, broadly ovoid, compressed, usually biconvex, black and minutely pitted.

Dehra Dun (Duthie). Flowers during the rainy season, DISTRIB.: Abundant on the Himalaya up to 10,000 ft., Parasnath in Bengal also in Assam, Burma and on the hills of W. and S. India, extending to Ceylon, China, Afghanistan and Africa. The above description refers to var. *nepalensis* of Hook. f. *F. B. I. v.*, 42.

14. *P. capitatum*, *Buch.-Ham. ex. Don. Prod. 73*; *F. B. I. v.*, 44; *Collett Fl. Siml. 423*, fig. 134; *Gage l. c. 428*.

A perennial herb. *Stems* many, leafy, 6-10 in. long, creeping from a stout woody usually twisted rootstock, usually reddish and clothed with brown hairs. *Leaves* crowded, bifarious, shortly stalked,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, ovate-elliptic, acute, downy on both surfaces, rather thick, eglandular, turning brown when dry; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in., with 2 small rounded glandular hispid auricles at the base. *Inflorescence* capitate; heads  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., dense-flowered, glandular and hairy; peduncles often glandular-hispid; involucral leaf none; bracts flat, ovate, acute, eciliate, glabrous. *Perianth* pink, 5-cleft, segments obtuse. *Stamens* 8. *Nutlets* 3-gonous,  $\frac{1}{16}$  in. long.

Dehra Dun, in crevices of rocks in many of the ravines (Duthie). Probably in other localities in Sub-Himalayan tracts eastwards. DISTRIB.: Sub-tropical and temperate Himalaya, up to 6,000 ft.; also on the Khasia hills and extending to China.

## 2. RUMEX, Linn. ; Fl. Brit. Ind. v, 58.

Perennial or annual herbs, rarely shrubs. *Leaves* mostly radical or cauline, alternate; stipules hyaline ochreate, often disappearing with age. *Flowers* 2-sexual or monoeious, in axillary clusters or in whorls arranged in simple or panicled racemes. *Perianth-segments* 6, rarely 4; inner accrescent, entire or toothed, midrib often enlarged or tubercled. *Stamens* 6, filaments short, anthers oblong. *Ovary* 3-gonous, styles 3, stigmas fimbriate. *Fruit* a small nut, enclosed in the usually enlarged inner perianth-segments, angles acute. *Seed* erect, embryo lateral, nearly straight, cotyledons linear or oblong.—Species about 140, in all temperate and in many tropical regions.

Flowers 2-sexual; inner fruiting sepals coriaceous;  
styles terminal; leaves never hastate:—

Inner fruiting sepals with narrow margins and  
few or no teeth:—

Leaves gradually narrowed into the petioles,  
tips usually acute; flowers distinctly  
stalked; inner fruiting sepals brownish-  
yellow . . . . . (*R. maritimus*).

Leaves cordate at the base and with a contrac-  
tion just above it, tips always obtuse;  
flowers shortly stalked; inner fruiting sepals  
much longer and almost black . . . . . 1. *R. nigricans*.

Inner fruiting sepals with wide much-toothed  
wings:—

Teeth of wings not hooked . . . . . 2. *R. dentatus*.

Teeth of wings usually hooked . . . . . 3. *R. nepalensis*.

Flowers 1-sexual or polygamous; inner fruiting  
sepals membranous; styles from the angles  
of the ovary; leaves hastate . . . . . (*R. hastatus*).

1. *R. nigricans*, Hook, f. in F. B. I. v, 59; Prain Beng. Pl. 888.

An erect annual,  $\frac{1}{2}$ - $1\frac{1}{2}$  ft. high. *Leaves* linear-oblong, obtuse, contracted  
above the cordate base, margins often waved or crisped. Flowering  
branches rigid, spreading, with or without leaves. *Flowers* shortly  
pedicelled, densely crowded in globose distant whorls or confluent  
heads. *Perianth* enlarging in fruit, nearly black; inner sepals large

and with a conspicuous oblong dark-coloured tubercle on the back : tips acute ; margins very narrow, entire or with one or two short straight teeth or spines. Styles terminal.

Edges of tanks near Banda in Bundelkhand (Mrs. Bell). DISTRIB. : Bengal, Behar, Khasia Hills and in the Deccan Peninsula. This species is very similar to the European *R. conglomeratus*, but the leaf is panduriform, and the tips of the valves are acute.

**2. *R. dentatus*, Linn. Mant. ii, 226 ; Royle Ill. 313 ; F. B. I. v, 59 ; Watt E. D. ; Prain Beng. Pl. 889 ; Cooke Fl. Bomb. ii, 518.**

An erect annual, 1-2 ft. high. Stems grooved, glabrous, usually tinged with red. Leaves 3-4 in. long, oblong, obtuse, glabrous, base rounded or cordate, petioles of radical leaves up to  $2\frac{1}{2}$  in. long. Flowers shortly pedicelled, 2-sexual, arranged in distinct leafy or leafless whorls. Perianth  $\frac{1}{8}-\frac{1}{5}$  in. long ; inner segments broadly ovate, reticulate-veined, much enlarged in fruit and with an ovoid-oblong smooth tubercle on its back, margins irregularly toothed or pectinate ; the teeth numerous, short, straight, not hooked. Nutlets  $\frac{1}{16}$  in. long, acutely 3-gonous or almost winged.

N. W. India (Royle), Dehra Dun (King), Sub-Himalayan tracts of N. Oudh and Gorakhpur (R. Thompson and Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell). DISTRIB. : From Bengal and Assam to W. and S. India ; also on the Himalaya up to 1,000 ft. in Kumaon and extending to China. Hooker alludes to a specimen from Oudh in which the inner segments of the perianth are very narrowly winged, thus showing a transition to *R. nigricans*. The roots yield a dye which is said to be used in Sind.

**3. *R. nepalensis*, Spreng. Syst. ii, 159 ; F. B. I. v, 60 ; Collett Fl. Siml. 428.**

Annual or occasionally perennial. Root sometimes with tuberous fibres (Boiss.) Stems stout, erect, 2-4 ft. high, branched. Leaves at the base of the stems up to 14 in. long, oblong or triangular-ovate, acute or obtuse, base cordate, petioles very slender ; upper leaves sessile or nearly so, narrowed to the base. Whorls distant, on elongate nearly leafless racemes. Fruiting sepals orbicular-ovate, broadly winged, one or more with an oblong tubercle on the back, wing pectinately toothed and strongly reticulate, teeth usually with hooked tips.

Dehra Dun (King), and in the Sub-Himalayan tracts of N. Oudh and Gorakhpur (Duthie). DISTRIB. : Temp. Himalaya from Bhutan to

Kashmir, up to 9,000 ft. or more; also on the hills of W. and S. India and extending to W. Asia and S. Africa. Its habit is that of *R. obtusifolius*, a common European species.

*R. MARITIMUS*, Linn.; *F. B. I.* v, 59; *Watt E. D.*; *Prain Beng. Pl.* 888.—There is a record of this plant having been found by Mr. A. O. Hume in marshes by the banks of the Jumna near Etawah. There are, however, no specimens at Kew from the area of this flora. As the plant appears to be fairly abundant in Bengal its occurrence within the eastern border of the Upper Gangetic Plain may be regarded as probable. I have therefore included it in the clavis where its distinguishing characters will be found. It occurs also in Assam and in the Central Provinces, and extends to N. Africa, Europe and in N. and S. America.

*R. HASTATUS*, Don *Prod.* 74; *Royle Ill.* 314; *F. B. I.* v, 60; *Watt E. D.*; *Brandis Ind. Trees* 521; *Collett Fl. Siml.* 428, *fig.* 136; *Gamble Man. Ind. Timb.* 553. Vern. *Chulmora* (Kumaon).—A somewhat glaucous perennial herb or small shrub, 1-2 ft. high. *Rootstock* woody. *Leaves* 1-2½ in. long, broadly triangular or hastately 3-lobed. *Flowers* minute, polygamous, pedicels lengthening in fruit. Inner enlarged sepals  $\frac{1}{8}$ - $\frac{1}{4}$  in. in diam., orbicular, notched at both ends, usually bright pink and very delicately veined.—Found occasionally in Dehra Dun at the base of the Himalaya. It is a common plant, on the W. Himalaya, ascending to 8,000 ft. and is found usually on exposed rocks and dry stony hillsides. The hill-station of Almora in Kumaon is said to have been so-called by reason of the abundance of this plant in that neighbourhood. The leaves are very acid and may be eaten as salad.

*R. VESICARIUS*, Linn.; *Roxb. Fl. Ind.* ii, 209; *F. B. I.* v, 61; *Duthie Field and Gard. Crops* iii, 45; *Watt E. D.*; *Collett Fl. Siml.* 428; *Prain Beng. Pl.* 889. Vern. *Chuka-sâk*. A pale-green rather fleshy glabrous annual. *Leaves* ovate. *Flowers* monocious. Fruiting sepals  $\frac{1}{2}$  in. across, orbicular, hyaline.—Cultivated in many parts of India as a vegetable. It is found wild on the hills of the W. Punjab, also in Afghanistan, Persia, the Levant and in N. Africa.

*CALLIGONUM POLYGONOIDES*, Linn.; *Brandis For. Fl.* 372; *Ind. Trees* 520; *F. B. I.* v, 22; *Watt E. D.* *Gamble Man.* 552; *Cooke Fl. Bomb.* ii, 510. Vern. *Phog, phok*.—An almost leafless shrub or small tree found within the arid districts of N.-W. India on both sides of the Indus, extending as far north as Lahore and eastwards to Bikanir, often gregarious. It is found also in Sind, and beyond India in Persia, Armenia and Syria. During the hot season the bushes are covered with the fragrant pinkish flowers which after falling are

swept up by the country people and eaten cooked. The fruit is densely setose. I have seen no specimens from the area included in this flora.

*FAGOPYRUM ESCULENTUM*, *Mænch*; *Don Prod.* 73; *Royle Ill.* 317; *F. B. I.* v, 55. *Watt E. D.*; *DC. L'Orig. Pl. Cult.* 279; *Duthie Field and Gard. Crops N. W. Prov. and Oudh* iii, 25, t. 83. *Vern. Pháphra, kulti, oglá.* (*Buckwheat*).—An erect glabrous annual 1-3 ft. high. Leaves triangular-cordate, acute. Flowers white or pink, in terminal subcapitate cymes. Nuts trigonous, acutely angled.—Much cultivated for its grain in Dehra Dun and in the Sub-Himalayan tracts eastwards, as well as in the hilly districts of Central and S. India; also extensively on the Himalayan ranges and up to 12,000 ft. in W. Tibet. Another species, known as *F. tataricum*, and distinguished by having the angles of the nuts blunt, is a much taller and coarser plant, and is usually restricted to the Himalaya and at rather higher elevations. It is much cultivated by the inhabitants of the higher villages.

*ANTIGONUM LEPTOPUS*, *Hook. and Arn.*; *Gamble Man.* 552; *Prain Beng. Pl.* 889; *Cooke Fl. Bomb.* ii, 519. The Coral Creeper.—A large handsome climbing shrub with bright pink flowers. It is a native of S. America, and is largely grown in the gardens of N. India.

*MUEHLENBECKIA PLATYCLADOS*, *Meissn.* (*Coccoloba platyclada*, *F. Muell.*).—A quaint-looking glabrous shrub with flattened leaf-like branches (*phylloclades*) is often grown in the gardens of Upper India. It is a native of the Solomon Islands.

### XCIII.—ARISTOLOCHIACEÆ.

Herbs or shrubs, often climbing, usually more or less foetid. Leaves alternate, entire or lobed; stipules none. Flowers 2-sexual, often large, usually lurid, terminal axillary or lateral, solitary racemose or cymose, with or without bracts. Perianth simple, more or less adnate below to the ovary, regular or irregular, 3-lobed or tubular, lobes valvate. Stamens 6 or more, adnate in 1 or 2 series to the top of the ovary or round the style; anthers erect; cells parallel, dehiscing dorsally. Ovary 4-6-celled; placentas parietal, free or extending to the axis; style columnar, stigma lobed; ovules many, anatropous. Fruit a capsule or berry. Seeds many; albumen copious, fleshy, embryo minute.—Species about 200, chiefly tropical.

## ARISTOLOCHIA, Linn. ; Fl. Brit. Ind. v, 74.

Shrubs or perennial herbs, often twining. Leaves with the petioles dilated at the base, and often with a stipule-like leaf of an undeveloped bud in the axil. Perianth coloured, tube inflated below, then contracted, hairy within; limb dilated, oblique, usually 2-lipped. Stamens 6, rarely 5 or more than 6; adnate in 1 series above the ovary, filaments or connectives not distinguishable from the style; anthers adnate to the column, dehiscing extrorse. Ovary inferior, more or less perfectly 6-celled, rarely 5- or 4-celled, style or column short and thick, divided above into 3 or 6 (rarely more) obtuse or linear lobes, ovules 2-seriate. Fruit a capsule, lantern-like, septicidally 6 (rarely 5)-valved, or splitting through the placentas. Seeds horizontal, often covered by the remains of the placentas.—Species about 180, chiefly tropical.

**A. bracteata**, Retz. Obs. Bot. fasc. v, 29; Roxb. Fl. Ind. iii, 490; Royle Ill. 330; F. B. I. v, 75; Watt E. D.; Prain Beng. Pl. 890; Cooke Fl. Bomb. ii, 524.—VERN. Kiramar.

A slender decumbent glabrous perennial herb. Stems 12-18 in. long, weak, prostrate; branches striate, glabrous. Leaves 1½-3 in. long and broad, reniform or broadly ovate, usually widely and shallowly cordate at the base, glaucous beneath, finely reticulate-veined, glabrous; petioles ½-1½ in. Flowers solitary; pedicels with a large sessile orbicular or subreniform bract at or near the base. Perianth 1-1½ in. long, base subglobose; tube cylindric, with a trumpet-shaped mouth, villous inside with purple hairs; lip as long as the tube, linear, dark-purple, margins revolute. Capsule ¾-1 in. long, oblong-ellipsoid, 12-ribbed, glabrous. Seeds ¼ in. long, triangular with a cordate base.

Banks of Jumna and Ganges (Royle), Bundelkhand (Edgeworth), Gwalior (Maries). Flowers at the end of the rainy season. DISTRIB. : Bengal, W. and S. India and in Ceylon, extending to Arabia and Tropical Africa. The whole plant is intensely bitter, and it is much used by Hindu doctors for its purgative and anthelmintic properties.

**A. INDICA**, Linn.; Roxb. Fl. Ind. iii, 489; Royle Ill. 330; F. B. I. v, 75; Watt E. D.; Prain Beng. Pl. 891; Cooke Fl. Bomb. ii, 594; Brandis Ind. Trees 522. (Indian Birthwort).—A climbing perennial herb with the under surface of the leaves green. It occurs in Nepal and over the greater part of Bengal, also in W. and S. India, and in Ceylon.

It is found in gardens within the area of this flora, and the very bitter roots, like those of *A. bracteata*, are used medicinally. Several exotic species are grown in Indian gardens as ornamental plants, notably some from Brazil with curious and highly coloured flowers.

#### XCIV.—PIPERACEÆ.

Herbs or shrubs, usually aromatic. *Leaves* alternate opposite or whorled, entire, gland-dotted; stipules none or 2, connate or adnate to the petiole. *Flowers* minute, 1- or 2-sexual, in axillary or terminal catkin-like spikes, subtended by a peltate bract. *Perianth* none. *Stamens* 2-6, rarely 7-8, hypogynous; anthers often jointed on the filaments, the cells sometimes confluent and bursting longitudinally. *Ovary* of 3 or 4 carpels free or connate at the base, each with many ovules, or ovary 1-celled with a solitary orthotropous ovule; stigmas distinct on the free carpels or ovary-lobes, or terminal on the undivided ovary, occasionally solitary, sessile, simple or penicillate. *Fruit* small, indehiscent, or of cocci or follicles. *Seeds* globose, ovoid or oblong, testa thin; albumen copious, floury, embryo enclosed in an amniotic cavity at the end of the albumen remote from the hilum, cotyledons minute or obsolete, radicle superior.—Species over 1,000, in tropical and sub-tropical regions, chiefly American.

Flowers 2-sexual; ovary of 3 or 4 free or connate carpels	1. HOUTTUYNIA.
Flowers usually dioecious; ovary 1-celled	2. PIPER.

#### 1. HOUTTUYNIA, Thunb.; Fl. Brit. Ind. v. 78.

Perennial herbs. *Leaves* alternate, usually cordate; stipules broad, membranous. *Spikes* terminal and leaf-opposed, peduncled, dense, usually with an involucre of 4-6 white petaloid bracts. *Flowers* minute. *Perianth* none. *Stamens* 3-6, filaments adnate at the base to the ovary, anthers oblong. *Ovary* of 3-4 partially connate 1-celled carpels; styles free, erect, stigmatose on the inner surface; ovules many, on parietal placentas. *Fruit* subglobose, bursting between the styles. *Seeds* many, globose, testa membran-

ous.—Species 2, one in N. W. America and the other Indian, extending to Siam, China and Japan.

**H. cordata**, Thunb. *Fl. Jap.* 214, t. 26; *Royle Ill.* 331; *F. B. I. v.* 78; *Kanjilal For. Fl. ed. 2*, 324; *Collett Fl. Siml.* 429.

A perennial herb with a creeping rootstock. *Stem* erect, 1-3 ft. high, leafy, angular, herbaceous, pubescent at the nodes. *Leaves* caulin,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long and broad, broadly ovate-cordate, acuminate, 5-nerved, abruptly narrowed into the petiole, glabrous or with the nerves pubescent beneath, gland-dotted; petiole 1-2 in.; stipules membranous, linear-oblong, obtuse, emarginate or bifid, adnate to the channelled petiole, ciliate on the margins. *Spikes*  $\frac{1}{2}$  in. long, dense-flowered, elongating in fruit; bracts  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, rounded or oblong. *Stamens* 3.

Sub-Himalayan tracts in N. Oudh (Duthie). *DISTRIB.* : Trop. Himalaya from the Punjab to Sikkim, up to 5,000 ft.; also Assam, the Khasia Mts. and Ceylon, extending to China and Japan.

**2. PIPER**, Linn.; *Fl. Brit. Ind. v.*, 78.

Shrubs, rarely herbs, erect or scandent, often glandular and aromatic, branches with swollen nodes. *Leaves* usually entire and often oblique, stipules various. *Flowers* very minute, dioecious, rarely 2-sexual, spicate, each in the axil of a bract, with or without 2 lateral bracteoles; bracts peltate or cupular, adnate to the rhachis, sometimes decurrent, with or without raised margins; bracteoles (when present) forming low ridges on each side of the flower or connate in a semilunar form. *Stamens* 2-4, rarely more; filaments short, anthers 2-celled, the cells distinct. *Ovary* 1-celled, style short, conic, beaked, or none, stigmas 2-5; ovule solitary, erect. *Fruit* a small ovoid or globose 1-seeded berry. *Seeds* usually globose, albumen floury within. Species about 600, in tropical and sub-tropical regions.

**P. brachystachyum**, Wall. *Cat.* 6656 in part; *Royle Ill.* 332; *F. B. I. v.*, 87; *Kanjilal For. Fl. ed. 2*, 325; *Gamble Man.* 554; *Collett Fl. Siml.* 430; *Brandis Ind. Trees* 523.—*Vern. Pahári pán.*

A glabrous much-branched rambling shrub. *Stems* often very long climbing on trees and rocks and rooting at the nodes; branches slender, rigid, terete, the lower often warted. *Leaves* petioled,

thinly coriaceous, 3-7 in. long, elliptic or ovate-lanceolate, obtusely caudate-acuminate, base acute; nerves prominent beneath; petioles slender,  $\frac{1}{2}$ - $\frac{1}{3}$  in.; leaves of the climbing stems much smaller, orbicular, pointed. **MALE** spikes 2-3 in. long, slender, drooping; bracts minute, peltate. **Stamens** 2, anthers reniform; cells confluent, dehiscent across the tip. **FEM.** spikes very shortly peduncled  $\frac{1}{2}$ - $\frac{1}{3}$  in. diam., globose or shortly oblong in fruit. **Berries**  $\frac{1}{6}$  in. in diam.; stigmas 3, very minute.

Dehra Dun on the banks of the Re nadi (Kanjilal), Sub-Himalayan tracts of N. Oudh in damp places (Duthie). **DISTRIB.** : Sub-tropical Himalaya from Simla to Bhutan, up to 5,000 ft.; also on the Khasia and Nilgiri Hills.

**PIPER BETLE**, *Linn.*; *Roxb. Fl. Ind.* *i*, 158; *F.B.I.*, *v*, 85; *Duthie Field and Gard. Crops N. W. Prov. and Oudh* *iii*, 51, *tt*. 91 and 91A; *Watt E. D.*; *Comm. Prod. Ind.* 891; *Gamble Man.*, 554; *Brandis Ind. Trees* 523; *Cooke Fl. Bomb.* *ii*, 528. **Vern.** *Pán, tambuli*, etc. (Betel pepper).—A perennial dioecious creeper extensively cultivated in the hotter and damper parts of India and in Ceylon extending to the Malay Islands. It is believed to have come originally from Java. The leaves mixed with portions of areca-nut, lime and catechu, are universally chewed by the natives of India, to which are added by well-to-do classes other ingredients such as cardamoms, nutmeg and camphor. For further particulars as to cultivation, etc., see Watt's *Comm. Prod. of India* 891.

**P. NIGRUM**, *L.* **Vern.** *Gul-mirch, kala-mirch.* (Black pepper).—This furnishes the ordinary pepper of commerce, black and white, the latter resulting in the grinding of the fruit after the removal of the outer skin. The plant is wild in Travancore and Malabar, and is cultivated in the hotter parts of India and in Ceylon and in the tropics generally.

**PEPEROMIA PELLUCIDA**, *H. B. & K.*; *Prain Beng. Pl.* 894; *Cooke Fl. Bomb.* *ii*, 629.—A slender much-branched glabrous and succulent annual. Has been introduced comparatively recently from S. America, and is becoming naturalized in various parts of India, and as a weed in the gardens of N. India.

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### XCV.—LAURACEÆ.

Aromatic trees or shrubs, very rarely (*Cassytha*) leafless parasites. **Leaves** usually alternate, gland-dotted, exstipulate. **Flowers**

small, regular, 2- or 1-sexual, in axillary cymes clusters panicles or racemes ; bracts deciduous, often involucrate or none. *Perianth* usually inferior ; tube short, sometimes enlarged in fruit ; lobes of limb small, usually 6, rarely 4, in two series, usually all similar and equal, imbricate, rarely sub-valvate, herbaceous or petaloid. *Stamens* usually a multiple of the perianth-lobes, in 2-4 series on the tube ; filaments flattened, inner or some or all often 2-glandular at the base ; anthers erect, 2- or 4-celled, rarely 1-celled, cells dehiscing by up-curved at length deciduous valve-like lids. *Ovary* sessile at the base of the perianth-tube, 1-celled, style terminal, stigma simple or discoid or dilated ; ovule solitary, pendulous from the apex of the cell, anatropous. *Fruit* a dry or fleshy berry on an often thickened peduncle, naked or rarely enclosed in or adnate to the perianth-tube. *Seed* pendulous, testa membranous, albumen none ; cotyledons plano-convex, fleshy ; radicle superior, minute.— Species about 1,000, chiefly in the warmer regions of Asia, Australia, America and the Pacific Islands.

Trees or shrubs :—

Anthers of the two outermost rows of stamens opening inwards, those of the third row opening outwards ; flowers hermaphrodite, usually panicled :—

Anthers all 2-celled ; perianth deciduous . . . 1. BEILSCHMEDIA.

Anthers all 4-celled ; perianth peristent :—

Perianth-lobes reflexed in fruit . . . . 2. MACHILUS.

Perianth-lobes erect in fruit ; flowers often polygamous . . . . 3. PHOESE.

Anthers of each row of stamens opening inwards, 4-celled ; flowers diœcious, in umbels, each umbel supported by an involucre of bracts :—

Leaves pinninerved ; stamens 9 or more, glands of the inner row sessile . . . . 4. LITSEA.

Leaves 3-nerved above the base ; stamens usually 6, glands of inner row stalked . 5. NEOLITSEA.

Leafless parasitic twining herbs . . . . 6. CASSYTHA.

## 1. BEILSCHMIEDIA, Nees; Fl. Brit. Ind. v. 121.

Evergreen trees or shrubs. *Leaves* alternate or opposite, pinnerved. *Flowers* small, 2-sexual, usually in panicles. *Perianth* tube short; lobes subequal. *Stamens* 9, perfect, those of the two outer series with eglandular filaments and with the anthers introrsely 2-celled; those of third series with 2-glandular filaments and with the anthers extrorsely 2-celled; anthers of the innermost series replaced by ovoid or cordate staminodes. *Ovary* sessile, free from the perianth, narrowed into the style, stigma obtuse. *Fruit* an oblong ovoid or globose berry; pedicel not or slightly thickened, the perianth quite deciduous. *Seed* with a membranous testa.—Species about 20, all tropical.

**B. Roxburghiana**, Nees in Wall. *Pl. As. Rar.* ii, 69; *Brandis For. Fl.* 378; *Ind. Trees* 528; *F. B. I. v.* 121; *Watt. E. D.*; *Gamble Man.* 559; *Prain Beng. Pl.* 897; *Haines For. Fl. Ch. Nagpur* 151. *B. fagifolia*, Nees; *F. B. I. v.* 122. *Laurus bilocularis*, Roxb. *Fl. Ind. ii*, 311.—Vern. *Konhaia* (Oudh).

A large or medium-sized almost evergreen tree. *Bark* ash-coloured. *Branches* many, spreading horizontally and forming a dense shady head. *Leaves* coriaceous, 6-10 in. long, elliptic or oblong-lanceolate, obtuse or bluntly acuminate, glabrous, dark-green and shining; base cuneate; main lateral nerves 6-12 pairs, prominent on both surfaces and finely and distinctly reticulate between; petioles  $\frac{1}{2}$ -1 in. long. *Peduncles* axillary and from the base of the young shoots, a little shorter than the petioles, pubescent, bearing a raceme or panicle of 6-12 flowers; bracts ovate, caducous. *Perianth* 6-partite; segments spreading or reflexed,  $\frac{1}{4}$  in. long, linear-oblong, hairy on both sides. *Filaments* hairy; anthers bilocular. *Berry* 1-1 $\frac{1}{2}$  in. long or more and about 1 in. in diam., narrowly oblong-ovoid, dark-purple when ripe and covered with a whitish-grey bloom which is easily rubbed off.

Forests of N. Oudh in the districts of Gonda and Bahraich, in shady ravines (R. Thompson). Flowers Mar.-April when the old leaves are falling. *DISTRIB.*: From Kumaon to Assam, Tipperah and Burma, also in Ch. Nagpur. The wood is white rather hard and even-grained, and is said to be used in Assam for making boats. I have not seen the specimens from N. Oudh.

## 2. MACHILUS, Nees ; Fl. Brit. Ind. v, 136.

Evergreen trees. *Leaves* alternate, usually crowded at the ends of the branchlets, pinninerved. *Flowers* small, 2-sexual, in axillary panicles. *Perianth-tube* short or obsolete; lobes persistent, spreading or reflexed in fruit. *Stamens* 9, perfect, filaments of the 1st and 2nd rows eglandular and with introrse 4-celled anthers; of the 3rd row with 2 stipitate glands at the base and with extrorse 4-celled anthers; those of the 4th row replaced by stipitate cordate staminodes. *Ovary* sessile, narrowed into the style; stigma discoid. *Fruit* a globose or oblong berry seated on the persistent perianth.—Species about 20, in E. Asia.

Leaves up to 6 in. long, somewhat glaucous beneath, main lateral nerves 8-12 pairs; perianth villous within; drupe globose,  $1\frac{1}{2}$  in. in diam. . . . . 1. *M. Gamblei*.

Leaves up to 10 in. long, distinctly glaucous beneath, main lateral nerves 12-18 pairs; perianth silky-tomentose outside; drupe globose,  $\frac{3}{4}$ - $1\frac{1}{2}$  in. in diam. . . . . 2. *M. Duthiei*.

1. *M. Gamblei*, King. in F. B. I. v, 138 and 860; Kanjilal For. Fl. ed. 2, 327; Gamble Man. 566; Brandis Ind. Trees 531.—Vern. Káwala.

A small or moderate-sized tree with dark grey bark; shoots and young leaves beneath finely silky. *Leaves* 3-6 in. long, elliptic-lanceolate to obovate, acute or acuminate, entire, thinly coriaceous, impressed-punctate on both surfaces, glaucous and glabrous beneath when mature, main lateral nerves 8-12 pairs, slender; petioles  $\frac{1}{2}$  in., slender. *Panicles* lax, few-flowered. *Sepals* linear-oblong, villous within. *Drupe* globose,  $1\frac{1}{2}$  in. in diam., black when ripe.

Dehra Dun, in shady and swampy localities, fairly common (Kanjilal). Flowers in March and April. DISTRIB. : Outer ranges of Himalaya eastwards to Bhutan and the Dumphla Hills at from 2—4,000 ft., also in the Assam Valley.

2. *M. Duthiei*, King in F. B. I. v, 861; Kanjilal For. Fl. (ed 2), 327; Gamble Man. 567; Duthie in Ann. R. Bot. Gard. Calc. ix, part 1, 67, t. 83; Collett Fl. Siml. 431, fig. 138; Brandis Ind. Trees 531.—Vern. Káwala bhadrao (Garhwal), bhojo (Jaunsar).

A medium-sized tree with a thin dark-grey rather rough bark; young parts finely silky. *Leaves* thickly coriaceous when mature, becoming reflexed in age, 6-10 in. long, oblong or elliptic-lanceolate, acuminate, often subfalcate, dark-green and shining above, glaucous beneath; main lateral nerves 12-20 pairs; petioles about  $\frac{1}{8}$  in. long. *Panicles* about 6 in. long when in flower; peduncles and pedicels rather stout, elongating and drooping in fruit, often tinged with red. *Flowers*  $\frac{1}{2}$  in. in diam. *Sepals* linear-oblong, finely silky outside, reflexed in fruit. *Drupe* globose,  $\frac{2}{3}$  in. in diam., changing from a dark sage-green colour to purple or almost black.

Sub-Himalayan tract of Rohilkhand in the Kota Dun at 2,000 ft. (Herb. Strachey and Winterbottom, Machilus No. 1); Kumaon Bhábar at Barmdeo (Herb. S. and W. No. 3), Kotri Dun at 1,800 ft. (Brandis). Flowers during April and May. *DISTRIB.*: W. Temp. Himalaya from Chamba and Simla to Nepal, ascending to 8,000 ft. This handsome tree is abundant in shady places on northern slopes of the outer Himalayan ranges, especially in Jaunsar and Garhwal. It is sometimes found associated with *M. odoratissima*, Nees to which the present species and some others had previously been referred, but it may easily be recognized by its larger leaves, the pubescent panicle-branches and flowers and especially by its globose drupes.

3. **PHŒBE**, Nees; Fl. Brit. Ind. v. 141.

Evergreen shrubs or trees. *Leaves* alternate, scattered or in clusters at the ends of the branchlets, penninerved. *Flowers* small, 2-sexual or polygamous, in axillary or sub-terminal panicles. *Perianth-tube* short; lobes 6, subequal, erect, accrescent and clasping the base of the fruit. *Stamens* 9, perfect; those of the 2 outer rows eglandular at the base and with extrose 4-celled anthers; of the 3rd row 2-glandular at the base, with extrose 2-celled anthers, those of the 4th row replaced by cordate or sagittate staminodes. *Ovary* sessile, narrowed into the style, stigma discoid. *Fruit* an ellipsoid or oblong berry, clasped at the base by the hardened perianth-segments.—Species about 26, in India and Malaya.

Quite glabrous except the young shoots and the perianth inside	1. <i>P. lanceolata</i> .
Panicles and flowers puberulous	2. <i>P. pallida</i> .

**1. *P. lanceolata*.** Nees *Syst. Laurin.* 109, *F. B. I. v.* 141; *Brandis For. Fl.* 377; *Ind. Trees* 532; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 328; *Gamble Man.* 568; *Collett Fl. Siml.* 432; *Prain Beng. Pl.* 900. *Laurus lanceolaria*, *Roxb. Fl. Ind.* ii, 308.—*Vern. Haulia* (Hind.), *tumri* (Dehra Dun).

A small evergreen tree with yellowish-white bark, quite glabrous except the very young parts and the perianth inside. *Leaves* thinly coriaceous, usually crowded towards the ends of the branches, 6-9 in. long, elliptic-lanceolate, caudate-acuminate, narrowed below into a short petiole; main lateral nerves 6-10 pairs. *Flowers* pale-yellow, 2-sexual, or sometimes polygamous,  $\frac{1}{15}$ - $\frac{1}{8}$  in. long, arranged in lax axillary panicles 2-4 in. long; peduncles slender, about 2 in. long when in flower, elongating in fruit. *Perianth-segments* broad, obtuse, villous inside, erect in fruit. *Fruit* narrowly ellipsoid, clasped at the base by the hardened perianth, black when ripe.

Sub-Himalayan tracts from Dehra Dun (Gamble) to the forests of N. Oudh (Brandis). Flowers Feb.-June. *DISTRIB.*: Outer Himalayan ranges from Simla to Bhutan up to 6,000 ft.; also on the Khasia Hills and in Burma. The wood is hard and close-grained and is said to be used for planks.

**2. *P. pallida*.** Nees *Syst. Laurin.* 112; *Brandis For. Fl.* 377; *Ind. Trees* 532; *F. B. I. v.* 142; *Gamble Man.* 567.

A small tree with finely puberulous shoots. *Leaves* coriaceous, 6-9 in. long, elliptic-lanceolate, or oblanceolate, acuminate, pubescent beneath when young; main lateral nerves 8-10 pairs, very oblique, deeply impressed above, prominent beneath. *Panicles* long-peduncled. *Flowers* puberulous.

Moist ravines in the forests of E. Oudh (Brandis). Flowers in June. *DISTRIB.*: Kumaon Himalaya up to 5,000 ft., and eastwards to Nepal and Sikkim. Perhaps too closely allied to *P. lanceolata* to be regarded as more than a variety.

**4. *LITSEA*, Lamk.; *Fl. Brit. Ind.* v, 155.**

Trees or shrubs, usually evergreen. *Leaves* alternate, rarely opposite or subopposite, pinninerved, rarely 3-nerved from the base, buds naked or scaly. *Flowers* small, dioecious, usually umbellate; umbels 4-6 (rarely more)-flowered, sessile or shortly peduncled; peduncles clustered, rarely solitary, axillary or in the

leaf-scars, sometimes racemose or fascicled on common peduncles ; bracts involucrate, 4-6, rarely more in one involucre, coriaceous or membranous. *Perianth-tube* ovoid campanulate or very short ; lobes of limb 6 or 4, equal or unequal, sometimes small or obsolete. **MALE** flowers : *Stamens* 9 or 12 in trimerous flowers, 6 in dimerous flowers, occasionally fewer than 6, rarely more than 12 ; filaments of 1st and 2nd rows usually eglandular, those of the 3rd (and 4th if present) 2-glandular ; anthers all introrse, 4-celled. *Ovary* minute or obsolete, very rarely perfect. **FEM.** fls. *Staminodes* 9 or 12, or in the dimerous flowers 6 (rarely more than 12). *Ovary* enclosed in the perianth-tube or free ; style short or long, stigma usually irregularly lobed. *Fruit* a drupe or berry seated on the unenlarged perianth, or partly clasped at the base by the often much enlarged discoid or cupular perianth-tube. *Seed* with a thin testa. — Species about 140, in Trop. Asia, Australia and the Pacific Islands, rare in Africa and America.

Perianth-lobes incomplete or none ; leaves oblong or ovate-acute, lower surface sparingly pubescent or closely tomentose ; fruit globose, seated on the slightly enlarged perianth-tube

2. *L. chinensis*.

Perianth-lobes complete, 6- or 5-partite :—

Leaves elliptic or elliptic-oblong ; upper surface glabrous ; lower surface grey- or tawny-pubescent ; main lateral nerves 5-10 pairs ; fruit ovoid, on a very small perianth-tube .

2. *L. polyantha*.

Leaves usually narrowly lanceolate, acute or acuminate, grey-hoary, rarely glabrous beneath ; main lateral nerves 8-15 pairs ; fruit on the enlarged per.-tube, ellipsoid .

3. *L. salicifolia*,  
var. *laurifolia*

1. *L. chinensis*, Lamk. *Encycl. Method*, iii, 574 ; *Cooke Fl. Bomb.* ii, 539 ; Gamble in *Journ. As. Soc. Beng.* LXXV, part. 1, 131. *L. sebifera*, Pers. *Syn.* ii, 4 ; *F. B. I.* v, 157 ; Watt *E. D.* ; *Kanjilal For. Fl.* (ed. 2), 329 ; Gamble *Man.* 570 ; *Prain Beng. Pl.* 902 ; *Brandis Ind. Trees*, 536. *Tetranthera laurifolia*, Blume ; (not of Roxb.) ; *Brandis For. Fl.* 379. *T. apetala*, Roxb. *Fl. Ind.* iii, 819 ; Royle *Ill.* 325. *T. Roxburghii*, Nees ; Royle *l. c.* — Vern. *Maida*, *gwa* (Hind.), *medh* (Oudh), *chandna* (Dehra Dun).

A small or medium-sized evergreen tree, very variable in habit foliage and inflorescence. *Bark* dark-grey, cork-like, with an inner viscid layer. Young parts inflorescence and underside of leaves more or less pubescent or tomentose. *Leaves* thinly coriaceous, 5-9 in. long, ovate oblong or elliptic-lanceolate, acute obtuse or rounded at the apex, glabrous or pubescent on the upper surface, grey-pubescent beneath and usually glabrescent when mature; main lateral nerves 8-12 pairs, and with fine reticulations between; petioles  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long. *Flowers* globose, white or yellowish,  $\frac{1}{2}$  in. in diam. before expansion, arranged in axillary peduncled corymbose or racemose umbels; bracts 4, tomentose. *Perianth* very irregular, the segments often wanting, tube long and silky. *Stamens* 9 to 20 or more; filaments villous. *Fruit* globose,  $\frac{1}{4}$  in. in diam., supported by the slightly enlarged perianth-tube.

Fairly common in the forests of Dehra Dun and Saharanpur, especially in shady ravines; also in the Sub-Himalayan districts of Rohilkhand, N. Oudh and Gorakhpur. It flowers in the rains and the fruit ripens during the cold season. *DISTRIB.* : Throughout the hotter parts of India and in Ceylon, extending to the Malay Islands, China and Australia. The wood of this tree, as described by Gamble, is greyish-brown or olive-grey, moderately hard and durable, and it is not attacked by insects. The granular and viscid inner bark (*meda-lakri*) is said to be good for sprains and bruises.

2. *L. polyantha*, Juss. in *Ann. Mus. Par.* vi, 211; *F. B. I. v.* 162; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 330; *Gamble Man 571*; *Collett Fl. Siml.* 433; *Prain Beng. Pl.* 903; *Brandis Ind. Trees 536*. *Tetranthera monopetala*, *Roxb. Fl. Ind. iii*, 821; *Brand. For. Fl.* 380; *t. 45*.—*Vern. Maida, katmarra* (Hind.), *karkawa, karka* (Dehra Dun).

A moderate-sized evergreen tree, the young parts inflorescence and underside of leaves rusty-tomentose. *Bark* dark-grey, finally exfoliating in corky-scales. *Leaves* alternate, very variable, 4-8 in. long or more, elliptic-oblong ovate or obovate, tip usually rounded or retuse, glabrous above, rusty-tomentose and strongly reticulate-veined beneath; main lateral nerves 5-10 pairs, base rounded or cordate, petiole  $\frac{1}{2}$ -1 in. long. *Umbels* 5-6-flowered, densely tomentose, pedicels stout, bracts 4-5. *Perianth* white, 6- or 5-partite. *Stamens* 9-13, filaments hairy. *Fruit* ovoid, about  $\frac{1}{4}$  in. long, seated on the small unchanged perianth.

Common in the forests of Dehra Dun and Saharanpur and eastwards to the Sub-Himalayan tracts of Rohilkhand and N. Oudh, often found in shady ravines and on the banks of streams. Flowers March-May.

the new foliage appearing at about the same time, and the fruit ripens about 3 or 4 months later. DISTRIB.: Salt Range and Punjab Himalaya and eastwards to Nepal up to 3,000 ft., also in Assam, Bengal, Central India, Orissa, Burma and Malay Peninsula, extending to Java and China. The wood of this tree is similar in appearance to that of *L. chinensis*, but is softer and less durable. Its medicinal properties are the same. The leaves when crushed have a strong scent of cinnamon, they are used in Assam for feeding the Muga silk-worm.

*L. salicifolia*, Hook. f. VAR. *laurifolia*, F. B. I. v, 167; *Prain Beng. Pl.* 903. *Tetranthera salicifolia*, Roxb. *T. laurifolia*, Roxb. *Fl. Ind.* iii, 823; *T. lanceæfolia*, Roxb. l. c. 822.

An evergreen bush or small tree; branchlets puberulous. Leaves sub-distichous, 3-5 in. long, variable in shape from elliptic to linear-lanceolate or linear-oblong, obtuse or acute or acuminate, brownish and glabrous above, grey-hoary rarely glabrous beneath; lateral nerves 8-15 pairs, prominent beneath; petioles  $\frac{1}{2}$ -1 in. Umbels clustered; pedicels short, slender. Stamens 6-9; filaments villous. Fruit  $\frac{1}{2}$  in. long, narrowly ellipsoid, seated on the funnel-shaped or clavate perianth-tube.

Forests in the Sub-Himalayan tracts of N. Oudh (Brandis). DISTRIB.: Outer Himalayan ranges from Nepal to Sikkim, up to 6,000 ft.; also in Assam, the Garo, Khasia and Naga Hills, Bengal Plain, Sundarbans and Chittagong, extending to Upper and Lower Burma.

5. **NEOLITSEA**, Merr.; included under *Litsea* in *Fl. Brit. Ind.* v, 178.

Evergreen trees. Leaves alternate opposite or in whorls, 3, nerved, more or less lanceolate; buds perulate. Flowers diœcious, in 3-7-fld. umbellules arranged in clusters or short racemes in the axils of the upper leaves or on the branchlets between the nodes, the clusters with small bracts at their bases; involucral bracts 4, deciduous; pedicels elongating. Perianth 4-partite. Stamens of male flowers 6; those of the 2 outer rows eglandular; the inner biglandular; anther-cells all introrse or the lower lateral. Staminodes of fem. flowers 6, arranged as the stamens, usually linear or linear-clavate. Ovary ovoid, style thick, stigma usually peltate, in the male flowers none or rudimentary. Fruit a globose or elliptic-oblong berry, seated on the slightly enlarged disciform

perianth-tube; pedicels somewhat elongate; pericarp smooth. Cotyledons hemispheric.—Species about 30, in India or Malaya, one or more extending to the Philippines and Australia.

**N. lanuginosa.** *Duthie.* *Tetradenia lanuginosa,* Nees in Wall. *Pl. As. Rar.* ii, 64. *Litsea lanuginosa,* Nees *Syst. Laur.* 634; *Brandis For. Fl.* 382; *Ind. Trees* 540; *F. B. I.* v, 178; *Kanjilal For. Fl.* (ed. 2), 331; *Gamble Man.* 573; *Collett Fl. Siml.* 433. *Tetranthera Cuipala,* *Don. Prod.* 65.

A tall or moderate-sized tree, with brownish bark. Leaf-buds conspicuous, enclosed within softly pubescent scales, the terminal ones often up to 1 in. in length. Leaves alternate or more or less crowded in whorls towards the ends of the branchlets, thickly coriaceous, 6-12 in. long, elliptic-lanceolate or -ob lanceolate, acute or acuminate, softly tomentose beneath when young, soon becoming glabrous and glaucous, prominently 3-nerved above the base; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. Flowers and bracts villous, the latter soon falling; pedicels of fem. flowers longer than those of the males. Perianth-segments fringed, silky outside. Stamens longer than the perianth; glands of the 2 inner filaments long-stalked. Berry about  $\frac{1}{2}$  in. long, its pedicel thickened towards the apex.

Dehra Dun, in the Mothronwala swamp (Kanjilal). Flowers Feb.-June. DISTRIB.: Outer Himalayan ranges from Kashmir, sparingly at about 3,000 ft., and eastwards to Sikkim up to about 6,000 ft., also on the Khasia Hills.

#### 6. CASSYTHA, Linn.; Fl. Brit. Ind. v, 187.

Filiform twining parasites, adhering to their hosts by suckers. Leaves of minute scales or none. Flowers minute, bisexual, sometimes dimorphic, in spikes heads or racemes, bracteoles 3. Perianth-tube short and globose, or in the same species often as long as the limb and turbinate; segments 6, the 3 outer smaller. Stamens 9 or 6, perfect, those of the 1st row with eglandular filaments and introrsely 2-celled anthers; of the 2nd row similar or reduced to staminodes; of the 3rd row with 2-glandular filaments and extrorsely 2-celled anthers; those of the 4th row replaced by sessile or stipitate staminodes. Ovary globose, free in flower, in fruit closely covered by the enlarged perianth; stigma sessile, small or capitate. Fruit a small drupe, enclosed in the succulent

perianth-tube and crowned by the perianth-lobes. *Seed* with thin testa, cotyledons at length confluent.—Species 15, one of which is widely spread throughout the tropics ; 1 or 2 are found in S. Africa and in Borneo ; the rest are Australian.

**C. filiformis.**, *Linn. Sp. Pl. 35 ; Roxb. Fl. Ind. ii, 314, F. B. I. v, 188 ; Watt E. D. ; Prain Beng. Pl. 904 ; Cooke Fl. Bomb. i, 541.*—Vern. *Amarbeli*.

A twining leafless parasite with the habit of *Cuscuta*, quite glabrous or the young parts puberulous. *Stems* long, slender, cord-like, often intricately matted, branched, dark-green. *Flowers* small, sessile, in lax dense divaricate spikes  $\frac{1}{2}$ -2 in. long ; bracteoles small, rounded, ciliate. *Perianth* twice as long as the bracteoles, tube short ; segments 6, in two rows, the three outer short ; the inner longer, oblong, acute, concave, valvate. *Fruit* about  $\frac{1}{4}$  in. in diam., globose, smooth, white, enclosed in the fleshy perianth-tube and crowned by the erect segments.

Bundelkhand (Edgeworth), and probably in many other localities within the area. **DISTRIB.** : Throughout the greater part of India, especially near the sea-coast, also, in Ceylon, the S. Andaman Islands, extending to the Malay Pen. and Islands, Arabia, Mascarene Islands, Trop. Africa, Australia, Polynesia and America.

The following plants belonging to genera not indigenous within the area of this flora deserve to be briefly mentioned :—

**CINNAMOMUM ZEYLANICUM**, *Nees in Wall. Pl. As. Rar. ii, 74 ; F. B. I. v, 131 ; DC. L'Orig. Pl. Cult. 116 ; Brandis For. Fl. 375 ; Ind. Trees 533 ; Watt Comm. Prod. Ind. ; Prain Beng. Pl. 899 ; Cooke Fl. Bomb. ii, 535.* *Laurus Cinnamomum*, *Roxb. Fl. Ind. ii, 295.*—The bark of this tree yields the true cinnamon of commerce. It is found wild in W. & S. India, Ceylon and Burma, and is cultivated in the Malay Islands and elsewhere in the tropics.

**C. TAMALA**, *T. Nees and Eberm. ; F. B. I. v, 128 ; C. albiflorum*, *Nees ; Royle Ill. 325.* *Laurus Cassia*, *Roxb. Fl. Ind. ii, 297.* Vern. *Dalchini, tezpat*.—A moderate-sized evergreen tree, closely allied to *C. zeylanicum*. It is found abundantly on the outer Himalayan ranges up to 7,000 ft., and the root-bark and leaves are much valued for medicinal purposes.

**C. CAMPHORA**, *T. Nees and Eberm.* (The Camphor tree of China and Japan).—An evergreen tree much cultivated in Indian gardens. It

thrives fairly well in Dehra Dun, and in the Government Garden at Saharanpur.

**PERSEA GRATISSIMA**, *Gaertn. j.* (The Avocada or Alligator Pear). A native of Trop. S. America. It is cultivated in Indian gardens. The pear-shaped fruit, about 4-6 in. long, contains a single seed which is embedded in a soft pulp.

**LAURUS NOBILIS**, *Linn.* (Sweet Bay or Laurel).—A small slow-growing evergreen tree of the Mediterranean region, and well-known on account of its aromatic leaves.

#### XCVI.—ELÆAGNACEÆ.

Shrubs or trees, copiously covered with silvery or brown scales. Leaves alternate or opposite, entire, exstipulate, usually coriaceous. Flowers small, regular, 2-sexual or dioecious, arranged in axillary fascicles spikes or racemes, rarely from leafless axils; bracts small, deciduous or none. Perianth in 2-sexual or female flowers tubular, narrowed above the ovary and persistent below, deciduous above; limb 2-4-lobed, rarely truncate; perianth in male flowers reduced to a 2-4-lobed limb. Stamens of 2-sexual flowers adnate to the throat of the perianth, those of the male flowers adnate to the base of the perianth, 4 alternate with or 8 both opposite to or alternate with the perianth-lobes; filaments free, usually short; anther oblong, 2-celled; cells parallel, contiguous, staminodes in female flowers none. Ovary free, 1-celled; style terminal, linear or dilated above, stigma lateral; ovule solitary, erect, basal, anatropous. Fruit a nut, enclosed in the perianth-tube. Seed erect, testa hard, albumen scanty or none, embryo straight; cotyledons thick, fleshy; radicle inferior, very short.—Species 17, in north temperate and tropical regions.

#### ELÆAGNUS, *Linn.*; Fl. Brit. Ind. v, 201.

Flowers 2-sexual, solitary or 2-3-nate, or sometimes on short leafless or leafy branchlets, bracts none. Perianth with an oblong or globose persistent base, narrowed above the ovary into a campanulate or funnel-shaped deciduous limb, yellow or white within, valvately 4-lobed and usually with a prominent ring inside above

the constriction. *Stamens 4*, on the mouth of the perianth. *Style* linear, included. *Fruit* enclosed in the persistent accrescent usually berry-like perianth-base, pericarp thin. *Seed* with a hard shining testa.—Species 12, in S. Europe, Temp. and Trop. Asia, Australia and N. America.

**E. latifolia**, Linn. *Sp. Pl.* 121; *Brandis For. Fl.* 390, t. 46; *Ind. Trees* 547; *F. B. I.* v. 202; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 334; *Gamble Man.* 581; *Prain Beng. Pl.* 908; *Cooke Fl. Bomb.* ii, 543; *E. conferta*, *Roxb. Fl. Ind.* i, 440; *Royle Ill.* 323. *E. arborea*, *Roxb. l. c.* 441; *Don. Prod.* 67.—Vern. *Ghiwai*.

A much-branched evergreen usually scandent shrub; branches often spinescent; young shoots densely clothed with shining rust-coloured scales. *Leaves* variable, thin or more or less coriaceous, 3-5 in. long, broadly elliptic to lanceolate, obtuse, acute or acuminate; upper surface pale-green, scurfy, the lower coated with silvery white or rust-coloured glistening scales; lateral nerves 6-8 pairs; base acute or rounded; petioles scaly,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* usually many in a cluster, straw-coloured, scented; pedicels elongating in fruit. *Perianth*  $\frac{1}{2}$  in. long, clothed with silvery scales, as are the pedicels; lobes  $\frac{1}{2}$  in. long, ovate, acute, spreading. *Style* hairy. *Fruit* crowned by the upper free portion of the perianth, about 1 in. long, ellipsoid or pear-shaped with 8 strong blunt ribs, pinkish when ripe and rough with small white spots; endocarp white, woolly within. *Seed*  $\frac{2}{3}$  in. long.

Dehra Dun, usually in swampy ground (Kanjilal); also in the Sub-Himalayan tracts eastwards. Flowers Nov.-Feb., and the fruit ripens during May and June. *DISTRIB.*: Subtrop. Himalaya from the Sutlej to the Mishmi Hills, ascending to about 8,000ft., and from Bengal and the Konkan southwards to Ceylon; extending to Burma, the Malay Peninsula and China. The sub-acid astringent fruit is much eaten by the village people and is sometimes used as a preserve. The wood affords a good fuel.

### XCVII.—LORANTHACEÆ.

Evergreen parasitic shrubs. *Leaves* opposite, usually entire, coriaceous, exstipulate, sometimes absent. *Flowers* 2- or 1-sexual, in racemes spikes heads or fascicles; bracts usually scale-like, bracteoles usually 2. *Perianth* simple or double. *Sepals*, or simple

perianth when sepaloid, adnate to the ovary, in fem. flowers solid or obsolete; limb annular or cupular, entire or shortly toothed. *Petals*, or simple perianth-segments when petaloid, 3-6, rarely 2, valvate, free or more or less connate in a tube or in a sheath split on the upper side. *Stamens* as many as and opposite the corolla-lobes and usually adnate to them; filaments usually filiform; anthers usually 2-celled, bursting longitudinally or by pores. *Disk* epigynous or in fem. flowers within the stamens, fleshy and rather prominent or none. *Staminodes* in fem. flowers and rudimentary ovary in male flowers rarely present. *Ovary* inferior, at first apparently solid, at length 1-celled; style short or long, stigma simple; ovule solitary, erect, adnate throughout to the walls of the ovary. *Fruit* a 1-seeded berry or drupe. *Seed* adnate to the pericarp; albumen fleshy, often toothed at the apex, or none; embryo straight, usually fleshy, radicle superior.—Species about 500, mostly tropical.

Flowers bisexual; style long . . . . .	1. LORANTHUS.
Flowers unisexual; style short or none . . . . .	2. VISCUM.

1. **LORANTHUS**, Linn. ; Fl. Brit. Ind. v, 203.

Semiparasitic shrubs, usually on trees. *Leaves* opposite, rarely alternate, usually thick and fleshy or coriaceous, nerves obscure. *Flowers* 2-sexual, usually coloured, in spikes racemes or cymes, axillary or on the old nodes; bracts concave or oblique, cupular; bracteoles 2, free or connate with the bract or none. *Perianth* double. *Calyx-tube* adnate to the ovary; limb short, truncate or 4-6-toothed or obsolete. *Petals* 4-6, valvate, free or more or less connate in a tube with spreading tips, or in a sheath split behind; tube naked or with conniving scales at the base. *Stamens* 4-6, adnate to the petals; anthers adnate or versatile, with parallel cells. *Disk* none. *Style* columnar, filiform, rarely twisted. *Fruit* a berry or drupe, 1-seeded. *Embryo* usually fleshy, cotyledons 2 or 4.—Species about 350, mostly tropical. .

Corolla of 4 free petals; flowers small, shortly pedicelled, rusty-pubescent; anthers continuous with the filaments, distinctly 2-celled	1. <i>L. ligustrinus</i> .
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Corolla gamopetalous, 4-5 lobed or-partite, the tube split above; anther-cells indistinct; flowers nearly always mealy or scurfy:—

Corolla 4-fid.; calyx hardly produced above the ovary; leaves mealy or scurfy on the lower and usually also on the upper surface:—

Fruit mealy, clavate; young shoots and leaves covered with flocculent white fugacious mealy tomentum; flowers long-pedicelled in solitary or fascicled racemes, scurfy white-tomentose . . . . .

2. *L. pulverulentus*.

Fruit tomentose, pyriform; young shoots and leaves covered with short soft rusty or white scurfy tomentum:—

Leaves less than 3 in. wide, sessile or shortly petioled; base cuneate or rounded, rarely subcordate, appressed tomentose or glabrate beneath . . . . .

3. *L. Scurrula*.

Leaves large, exceeding 3 in. in width, orbicular or broadly ovate; base cordate or rounded, densely tomentose beneath; petioles long . . . . .

4. *L. cordifolius*.

Corolla 5-fid.; calyx distinctly produced above the ovary; leaves and flowers glabrous; fruit oblong . . . . .

5. *L. longiflorus*.

**L. ligustrinus**, Wall. in Roxb. *Fl. Ind.* (ed. Carey and Wall.) *ii*, 219; Don. *Prod.* 143; Brandis *For. Fl.* 395; *Ind. Trees* 549; *F. B. I. v.*, 207; Kanjilal *For. Fl.* (ed. 2), 336; Gamble *Man.* 582; *Prain Beng. Pl.* 811.

A parasitic shrub, or sometimes a small terrestrial tree parasitic on roots; young shoots and inflorescence rusty-pubescent; bark pale-coloured, closely lenticellate. Leaves glabrous, opposite or the upper alternate,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, lanceolate, obtuse acute or acuminate, pen-ninerved, brown or black when dry, thinly coriaceous; nerves obscure; base acute; petioles  $\frac{1}{2}$ - $\frac{1}{3}$  in. Racemes axillary, single or in pairs,  $\frac{1}{2}$ -in. long. Flowers 4-merous,  $\frac{1}{2}$ -in. long; pedicels very short; buds sub-terete, swollen at the base; bracts rather large, orbicular. Calyx-limb entire. Corolla pink outside, deep-red within. Petals 4, free,

linear, reflexed from the middle. *Ovary* urceolate, rusty-pubescent. *Fruit*  $\frac{1}{2}$  in. long, ovoid, truncate, brown when ripe.

Dehra Dun, occasionally met with in the forests (Kanjilal); Siwalik range in the Timli Pass (Griffith). Flowers May-July. DISTRIB.: Outer Himalayan ranges from the Jumna to Sikkim, ascending to 4,000 ft.; also in Assam, the Khasia Hills and in Chittagong.

2. *L. pulverulentus*, Wall. in Roxb. *Fl. Ind.* (ed. Carey and Wall.) *ii*, 221; Brandis *For. Fl.* 396; *Ind. Trees* 549; *F. B. I. v*, 211; *Kanjilal For. Fl.* (ed. 2), 337; *Gamble Man.* 582; *Prain Beng. Pl.* 911.

A robust branch-parasite; branchlets and young leaves clothed with white flocculent fugacious mealy tomentum. *Leaves* opposite, long-petioled, 2-8 in. long, broadly ovate, acute or obtuse, glabrous, dark-brown when dry; nerves distinct, arching. *Racemes* solitary or in fascicles,  $\frac{1}{2}$ - $2\frac{1}{2}$  in. long; bracts minute. *Flowers* about 1 in. long, on long pedicels, scurfily white-tomentose. *Calyx-limb* none. *Corolla* slender, curved, green when fresh, cream-coloured when dry; tube terete, split above; lobes 4, connate. *Fruit* clavate, mealy.

Forests of Dehra Dun and Saharanpur, and in the Sub-Himalayan tracts eastwards; often found on *dhák*, *shisham* and on other trees. Flowers Dec.-June. DISTRIB.: Subtropical Himalaya, from Chamba and Garhwal to Bhutan, up to 3,000 ft., also in N. Bengal and in the C. Provinces.

3. *L. Scurrula*, Linn. *Sp. Pl.* ed. 2, 472; *Roxb. Fl. Ind.* *i*, 550; *F. B. I. v*, 208; *Kanjilal For. Fl.* (ed. 2), 336; *Gamble Man.* 582; *Prain Beng. Pl.* 911; *Cooke Fl. Bomb. ii*, 546; *Brandis Ind. Trees* 549.

A large bushy branch-parasite, very variable. *Branches* terete; bark often copiously lenticellate; young parts rusty-tomentose. *Leaves* opposite, sessile or stalked, coriaceous,  $1\frac{1}{2}$ -3 in. long, less than 3 in. wide, elliptic or ovate-oblong, obtuse, glabrous or nearly so above, more or less rusty-tomentose beneath, or subglabrous beneath (when mature); base sub-acute or rounded, rarely sub-cordate. *Flowers*  $\frac{1}{2}$  1 in. long, arranged in axillary short-peduncled rusty or grey-tomentose sub-racemose fascicles; pedicels slender; buds clavate; bracts minute, obliquely ovate, concave, tomentose. *Calyx* subcuneate; limb truncate, very short. *Corolla* greenish-yellow, tomentose; lobes 4, narrow, acute. *Fruit*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, pyriform, tomentose. *Albumen* pink, obtusely quadrangular at the radicle end, the other end terminating in a hard elongated point, surrounded by a green sticky layer;

embryo green, fusiform ; radicle not distinguishable from the tigellus (Telbot in *Trees* *Bomb.* ed. 2, p. 289).

Siwalik range (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers during the cold season. *DISTRIB.* : Throughout the greater portion of India (except the Punjab and Sind), extending to Ceylon and the Malay Peninsula and Islands.

4. *L. cordifolius*, *Wall.* in *Roxb. Fl. Ind.* (ed. *Carey and Wall.*) *ii*, 222 ; *Don Prod.* 143 ; *Brandis For. Fl.* 396 ; *Ind. Trees* 549 ; *F. B. I. v*, 209 ; *Kanjilal For. Fl.* (ed. 2), 337 ; *Collett Fl. Siml.* 438 ; *Prain Beng. Pl.* 911.

A stout branch-parasite ; young shoots and leaves covered with soft rusty or white scurfy tomentum. *Leaves* opposite, orbicular or broadly ovate, exceeding 3 in. in width, obtuse or rounded at the apex ; base rounded or cordate ; lower surface densely white-tomentose ; petioles about  $\frac{1}{2}$  in. long or more. *Flowers*  $\frac{2}{3}$ -1 in. long, arranged in short lateral 2-chotomous corymbs, densely rufous or white-tomentose ; buds acute. *Corolla* slender, curved, terete ; tube split behind ; lobes 4, short, acute. *Fruit* clavate,  $\frac{1}{2}$  in. long, tomentose.

Dehra Dun and Siwalik range (Kanjilal), also in N. Oudh in the Bahraich forests (Duthie). Flowers during the cold season. *DISTRIB.* : Outer Himalayan ranges from Kashmir to Nepal, up to 5,000 ft. ; abundant on *Woodfordia* in Behar and Chota Nagpur, extending southwards to the Nilgiri Hills and Ceylon. It is very closely allied to *L. Scurrula* from which it may be distinguished by its greater size, its much broader and usually cordate leaves and by the copious white tomentum.

5. *longiflorus*, *Desr.* in *Lamk. Encycl. Meth.* *iii*, 598 ; *Brandis For. Fl.* 397 ; *Ind. Trees* 549 ; *F. B. I. v*, 214 ; *Watt E. D.* ; *Kanjilal For. Fl.* (ed. 2), 337 ; *Gamble Man.* 583 ; *Collett Fl. Siml.* 439 ; *Prain Beng. Pl.* 911 ; *Cooke Fl. Bomb.* *ii*, 548 ; *L. bicolor*, *Roxb. Fl. Ind.* *i*, 548.—*Vern. Banda, patha.*

A large bushy usually glabrous branch-parasite ; bark grey, smooth. *Leaves* usually opposite, glabrous and thickly coriaceous, 3-7 in. long, very variable in shape and venation, ovate elliptic or linear-oblong, obtuse ; midrib prominent, usually red, secondary nerves obscure ; petioles stout,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long. *Flowers* in stout spreading axillary or supra-axillary unilateral racemes, often two from an axil ; pedicels short ; bracts broadly ovate, concave, subacute. *Calyx*

distinctly produced above the ovary,  $\frac{1}{8}$  in. long, hoary-tomentose, tube cylindrical; limb cupular truncate or shortly 5-toothed. *Corolla* usually glabrous; tube curved, widened upwards, split on the back, red or orange, rarely pink or white; lobes 5, linear, reflexed,  $\frac{3}{8}$  in. long, the green or yellowish. *Fruit*  $\frac{3}{4}$ - $\frac{1}{2}$  in. long, ovoid-oblong, crowned by the cup-shaped calyx, black when ripe. *Albumen* white, copious, with five linear teeth at the top surrounding the green embryo, which resembles a small nail  $\frac{1}{4}$  in. long with a flattened head representing the radicle. (Talbot in *Trees* Bomb., ed. 2, p. 290).

Abundant in all parts of the area and especially in the forest tracts, where it is very destructive to a great many kinds of trees, especially the *mango*, the *mahuwa*, and *nim*. It flowers chiefly during the cold season. *DISTRIB.* : More or less throughout India, ascending to 3,000 ft. in the W. Himalaya; also in Ceylon, Burma and Australia.

In the Government garden at Saharanpur there used to exist a very interesting specimen in which this species of *Loranthus* played a prominent part as illustrating the occurrence of parasitism on the branches of an epiphyte (*Ficus religiosa*). This latter, having commenced life as an epiphyte on the stem of a Wild Date Palm (*Phoenix sylvestris*), rapidly developed its aerial roots downwards so as ultimately to form a continuous casing round the entire trunk of the palm from a height of 20 feet or more. The presence of some kind of lichen growth on the woody branches of the *Loranthus* would have added a further link to the interesting symbiotic history of this remarkable composite specimen of vegetation.

## 2. VISCUM, Linn; Fl. Brit. Ind. v, 223.

Shrubs, semi-parasitic on trees. *Leaves* flat and thick, or reduced to small scales or teeth. *Flowers* small, dioecious or monococious, fascicled or rarely solitary in the axils or on nodes, rarely terminal; bracts usually small; bracteoles free or connate, rarely obsolete. *Perianth-tube* of male-flowers short, solid, of the females adnate to ovary; limb 3-4 lobed, lobes usually deciduous. *Stamens* 3-4; anthers broad, sessile, adnate to the perianth-lobes; cells confluent, opening by many pores. *Ovary* inferior; stigma sessile or subsessile, large, pulvinate. *Fruit* a succulent berry, the mesocarp soft and viscid. *Embryo* in fleshy albumen, solitary or 2 in each seed.—Species about 30, in temp. and trop. regions.

Branches leafy, terete . . . . .	1. <i>V. monoicum</i> .
Branches leafless, flattened . . . . .	2. <i>V. articulatum</i> .

1. **V. monoicum**, Roxb. *Hort. Beng.* 105; *Fl. Ind.* iii, 763; *Brandis For. Fl.* 393; *Ind. Trees* 552; *F. B. I. v*, 224; *Watt E. D.*; *Gamble Man.* 584; *Prain Beng. Pl.* 912; *Cooke Fl. Bomb. ii*, 552.

A large parasitic shrub. *Branches* slender, smooth, terete, slightly swollen at the nodes. *Leaves* shortly petioled, rather thin and usually drying black, 1.5 in. long, variable in width, obliquely ovate or lanceolate, often falcately curved, acute or acuminate; basal nerves 3-5, prominent. *Flowers* minute, monoecious, greenish, arranged in axillary sessile or shortly stalked usually 3-flowered fascicles; central flower of each fascicle usually male; bracts truncate, apiculate. *Perianth-lobes* 3 or 4, triangular-oblong. *Berry*  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, oblong, narrowed at both ends.

Bundelkhand (Edgeworth); Forests of N. Oudh (Vicary, R. Thompson, Duthie), Gorakhpur (Vicary). Flowers in May. *DISTRIB.*: Behar, Chota Nagpur, W. and C. Bengal, Sundarbans; also in the Nepal and Sikkim Terai, Khasia Hills, Bombay Pres., S. India, Ceylon and Burma. The Bundelkhand specimens collected by Edgeworth near Banda on *Zizyphus xylopyrus* and *Bassia latifolia* indicate a more robust habit of growth. The leaves are much broader and excessively coriaceous, and the light brown colour to which they have dried gives them a different aspect as compared with typical specimens from other localities in N. India. Trimen says that in Ceylon the plant dries to a pale yellowish-brown colour. Sir Joseph Hooker was of opinion that the Banda plant might prove to be a different species. The only available material now at Kew is, however, insufficient to settle this point.

2. **V. articulatum**, Burm. f. *Fl. Ind.* 311; *F. B. I. v*, 226; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 339; *Gamble Man.* 584; *Collett Fl. Siml.* 440; *Prain Beng. Pl.* 913; *Brandis Ind. Trees* 552; *Cooke Fl. Bomb. ii*, 553; *V. attenuatum*, DC.; *Brandis For. Fl.* 394. *V. dichotomum*, Don. *Prod.* 142. *V. opuntioides* Heyne; *Roxb. Fl. Ind.* iii, 763.—*Vern. Budu, pand.*

A much-branched parasitic leafless shrub forming pendulous tufts 6 in. to 3 ft. long. *Branches* jointed, the internodes 1-2 in. long, flattened somewhat narrowed at each end, readily disarticulating, pale-green when fresh, yellowish-brown when dry and longitudinally furrowed. *Flowers* monoecious, very minute, 3-4-merous, very shortly stalked, 1-6 together in fascicles at the nodes, each with a cupular bract at the base. *Perianth* of male flowers reflexed. *Female* flowers 2-bracteolate, the perianth-lobes erect, triangular. *Berry*  $\frac{1}{4}$  in. in diam., subglobose, greenish-yellow, smooth.

Bundelkhand (Edgeworth), Siwalik range near Dehra Dun (Kanjilal).  
 DISTRIB.: Sub-trop. Himalaya from the Punjab eastwards to Sikkim and up to 3,000 ft.; also in Central, W. and S. India and Ceylon; extending to Burma and the Malay Peninsula and Islands to Australia. *V. dichotomum* appears to be the more common form within the area of this flora, and may be distinguished by its more robust habit and by its thicker and broader internodes.

*V. ALBUM*. Linn. is the true "Mistletoe," easily distinguished from the other species of this genus by its large flat coriaceous leaves, the dioecious flowers, and by its white almost transparent berries. In India it is confined to the N. W. Himalaya at elevations between 4,000 and 9,000 ft. It is found on various trees, but very rarely on oaks. It extends westwards through Afghanistan to the Atlantic and to N. Asia and eastwards to Japan.

### XCVIII.—SANTALACEÆ.

Trees shrubs or herbs, often semi-parasitic on roots. *Leaves* alternate or opposite, quite entire, sometimes scale-like or none, nerves inconspicuous, stipules none. *Flowers* 2- or 1-sexual, regular, usually small, in simple or compound cymes, bracts usually small or sometimes leafy; bracteoles 2, free or connate, sub-opposite, sometimes one or both obsolete. *Perianth* superior or inferior, simple, green or coloured; limb 3-8-toothed-lobed or -partite, lobes with often a tuft of hair behind the anthers. *Stamens* at many as and opposite the perianth-lobes, adnate above, rarely at its base; filaments filiform or broad; anthers 2-celled, bursting inwards or laterally. *Disk* epigynous or perigynous. *Ovary* usually inferior and 1-celled, style usually short, stigma entire or 3-6-lobed; ovules 2-3, adnate to or pendulous from a central column, rarely solitary and basal. *Fruit* a nut or drupe. *Seed* globose or ovoid, smooth rugose or sulcate, testa thin or obsolete; albumen copious, fleshy, radicle superior.—Species about 250, in temp. and trop. regions.

**OSYRIS**, Linn.; Fl. Brit. Ind. v. 231.

Shrubs, Glabrous, branchlets acutely angular. *Leaves* alternate, entire, exstipulate. *Flowers* small, axillary, polygamous; male-flowers in clusters, the bisexual often solitary. *Perianth-tube* solid in the male-flowers, of the bisexual flowers adnate to the ovary; lobes 3-4, triangular, valvate, with a tuft of hairs on the face.

*Stamens* 3 or 4, inserted at the base of the perianth-lobes; anther-cells distinct. *Disk* angular. *Ovary* inferior, sunk in the perianth-tube, style short, stigmas 3-4-fid.; ovules 2-4, pendulous from a short stout central placenta. *Fruit* a globose or ovoid drupe. *Seed* globose, solitary.—Species 5 or 6, in S. Europe, Africa and India.

*O. arborea*, Wall. *Cat.* 4035; *Royle Ill.* 322; *Brandis For. Fl.* 399; *Ind. Trees* 554; *F. B. I. v.* 232; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 340; *Gamble Man.* 588; *Collett Fl. Siml.* 442, *i*, 144; *Cooke Fl. Bomb. ii.*, 555.

A large usually glabrous shrub; young branches sharply triangular, puberulous at the tips. *Leaves* sub sessile, coriaceous, glaucous, becoming black when dry, 1-2 in. long, elliptic or oblong-lanceolate or obovate-oblong and mucronate, base cuneate. *Flowers* minute, polygamous (male and 2-sexual), yellowish-green. *Male-flowers* shortly stalked, arranged in long-peduncled 5-10 flowered umbels or panicles. *Bisexual flowers* solitary in the axils, the peduncles elongating and drooping in fruit. *Perianth* 3-lobed. *Stamens* 3, opposite the perianth-lobes and alternate with the lobes of the fleshy disk. *Drupe* subglobose,  $\frac{1}{2}$ - $\frac{1}{3}$  in. in diam., yellow or red when ripe.

Dehra Dun and Siwalik range, and in the Sub-Himalayan tracts eastwards. Flowers Dec.-April. *DISTRIE.*: Outer Himalayan ranges from the Sutlej to Bhutan, up to 7,000 ft. (but not in Sikkim); extending to Central and S. India, Ceylon and Upper Burma.

*SANTALUM ALBUM*, Linn.; *Roxb. Fl. Ind. i.*, 442; *F. B. I. v.*, 231; *Watt Comm. Prod. Ind.* 976; *Brandis Ind. Trees* 553; *Gamble Man.* 585; *Prain Beng. Pl.* 914; *Cooke Fl. Bomb. ii.*, 555.—*Vern.* *Chandan* (Sandalwood Tree).—A small glabrous evergreen tree with drooping branches. The yellowish-brown strongly-scented heartwood constitutes the well-known sandalwood of commerce. The tree is indigenous in the Western Peninsula southwards from Nasik and the N. Circars, cultivated elsewhere.

#### XCIX.—EUPHORBIACEÆ.

Herbs, shrubs or trees, often with milky juice. *Leaves* usually alternate, rarely divided or compound; stipules usually small, caducous or persistent, rarely connate in a bud-protecting sheath, sometimes replaced by glands or thorns. *Flowers* usually small or minute, always 1-sexual; inflorescences various, usually com.

pound, sometimes (in *Euphorbia*) consisting of single naked 1-stamened florets in a perianth-like involucre surrounding a pistil, more often with the main inflorescence contripetal axillary or iracemose, the subdivisions cymose, sometimes wholly cymose on terminal dichotomous panicles, or reduced to simple clusters or solitary florets; bracts usually solitary, small and scale-like, sometimes enlarged or 2-3-connate and forming an involucre; bracteoles often 2 within each bract or numerous in the more open cymes. *Perianth* often small, sometimes obsolete, often dissimilar in the two sexes, usually simple, calycine and with the segments valvate or imbricate, sometimes calycine 2-seriate and imbricate with the segments all similar, or occasionally dissimilar and rarely double, the inner then of 4 or 5 scale-like or very rarely conspicuous petals. *MALE-flowers*. *Torus* sometimes forming an intra-staminal disk or disk-glands or of lobes alternate with the stamens of the outer series. *Stamens* 1-many, free or connate; anthers 2-celled, with longitudinal transverse or porous dehiscence. *FEMALE-flowers*. *Sepals* usually larger and less connate than in the male. *Disk* hypogynous, entire or of distinct glands, or none. *Staminodes* often present. *Ovary* superior, usually of 3 more or less united carpels, styles as many as the carpels, united free or divided, stigmas usually on the inner face of the styles or style-arms; ovules 1-2 in each carpel, pendulous from the inner angle of the cell, the funicle often thickened. *Fruit* usually a capsule of three 2-valved 1-2-seeded cocci separating from a persistent axis, or a drupe with 1-3 cells, or of one or more combined nuts. *Seeds* laterally attached at or above the middle of the cells with or without an aril or caruncle at the hilum; embryo straight, enclosed in fleshy albumen; cotyledons flat, leafy, radicle superior, albumen rarely none and cotyledons fleshy. Species about 4,000, throughout the world, except in Arctic regions, but chiefly tropical.

Flowers monocious, in heads resembling single flowers consisting of a calyx-like involucre enclosing several flowers without a perianth, *viz.*, many males, each consisting of a solitary pedicelled stamen surrounding a single central female consisting of a 3-carpelled pistil; fruit a capsule.—Herbs shrubs or small trees with milky juice . . . .

1. EUPHORBIA.

Flowers dioecious or monococious ; inflorescence mostly axillary or lateral ; perianth of sepals always present and sometimes also petals :—

Stamens of the outer or only series opposite the sepals, or if stamens are all in centre of the flower the cells of the 2-many-carpelled ovary are each 2-ovuled ; petals, when present, minute ; sepals in one or two series :—

Leaves 3-foliolate, leaflets crenate ; fruit a berry.—A large tree . . . . . 2. BISCHOFIA.

Leaves simple, usually entire :—

Male flowers in axillary fascicles or solitary in the axils :—

Corolla of 5 (rarely 6) scale-like petals :—

Ovary 2-celled ; fruit indehiscent.— Trees or scandent shrubs . . . . . 3. BRIDELIA.

Ovary 3-celled ; fruit a capsule.— A small deciduous tree . . . . . 4. CLEISTANTHUS.

Corolla absent in both sexes ; sepals imbricate :—

Styles confluent in a column or cone ; disk none in either sex ; anthers 3-8, adnate to a central column ; fruit a capsule.—Evergreen shrubs or trees . . . . . 5. GLOCHIDION.

Styles separate or if partially connate the style-arms and stigmas free :—

Styles or style-arms slender :—

Pistillode in males large ; disk present in both sexes ; filaments free.—Dioecious shrubs . . . . . 6. FLUGGEA.

Pistillode absent in males :—

Disk none in either sex :—

Shrubs or small trees . . . . . 7. BREYNIA.

## EUPHORBIACEÆ.

Disk present in the fem. and often in the male flowers ; filaments free or united ; fruit usually a capsule, rarely a berry or drupe.—

Herbs, shrubs or trees . . . . .

8. PHYLLANTHUS.

Style much dilated ; fruit a 1-seeded drupe :—

Stamens 2-4, central.—An evergreen tree . . . . .

9. PUTRANJIWA.

Stamens 4-many, surrounding a broad disk.—An evergreen tree . . . . .

10. CYCLOSTEMON.

Male flowers in axillary panicled spikes or racemes ; stamens free round a rudimentary pistillode ; fruit a drupe.—Trees or shrubs with dioecious flowers . . . . .

11. ANTIDESMA.

Stamens of the outer or only series alternate with the sepals, or, if stamens are all in the centre of the flower the cells of the 2-3-(rarely 4-) carpelled ovary are each 1-ovuled ; petals, if present, often exceeding the sepals :—

Petals present in both sexes ; fruit a capsule :—

Flowers solitary or clustered on the rhachis of a terminal raceme.—Trees or shrubs, rarely herbs . . . . .

12. CROTON.

Flowers in axillary bracteate racemes ; leaves sinuate-toothed or lobed ; fruit a capsule.—Hispid or stellately tomentose herbs . . . . .

13. CHROZOPHORA.

Petals none in either sex ; male sepals 4-5, imbricate, free ; fruit a capsule.—A stout undershrub . . . . .

14. BALIOSPERMUM.

Male calyx closed in bud, usually membranous, splitting valvately into 3-5 concave sepals, the sepals of the fem. calyx sometimes imbricate :—

Styles distinct, often, 2-fid. multifid or papillously fimbriate :—

Filaments free :—

Stamens few ; anther cells united by their bases only ; styles very long, laciniate or fimbriate ; fruit a capsule.—  
Herbs . . . . . 15. ACALYPHA.

Stamens many ; anther-cells attached by a narrow or broad connective :—

Leaves opposite ; flowers dicous, rather large, appearing before the leaves ; anther-cells oblong ; fruit a drupe.  
—A soft-wooded tree . . . . . 16. TREWIA.

Leaves alternate or opposite ; flowers minute, dicous ; anther-cells globose ; fruit a capsule.—A small evergreen tree . . . . . 17. MALLOTUS.

Filaments connate in bundles or branched ; fruit a capsule :—

Flowers dicous, male and fem. in axillary or infra-axillary spikes ; seeds with a thin fleshy coat ; fruit a capsule.—An evergreen willow-like shrub . . . . . 18. HOMONOIA.

Flowers monœcious, in terminal subpanicked racemes, the upper ones male and crowded, lower fem. ; seeds with a firm coat ; fruit a capsule.—A tree-like annual herb with palmate serrate-lobed leaves . . . . . 19. RICINUS.

Styles united below in a stout column and continuous with the body of carpels ; male calyx valvately 3-5-partite ; stamens 3 ; fruit a capsule.—Twining perennial herbs . . . . . 20. TRAGIA.

Calyx of male flowers open in bud ; leaves alternate ; stamens 2 ; styles free or connate at the base ; fruit a capsule.—Trees with monoecious flowers in terminal spikes . . . . 21. SAPIUM.

1. EUPHORBIA, Linn.; Fl. Brit. Ind. V, 244.

Herbs, shrubs or small trees of various habit and provided with copious milky juice. *Stems* slender and leafy or thick and fleshy, sometimes leafless or nearly so. *Leaves* alternate or opposite, usually entire. *Flowers* monoecious, combined in an inflorescence of many male florets surrounding a solitary female, all enclosed within a small 4-5-lobed turbinate or campanulate perianth-like *involucre*, involucre-lobes with thick glands at the sinuses, glands with often a petaloid spreading white or coloured limb. *MALE*-flowers composed of a simple pedicelled stamen without floral envelopes, anthers 2-celled. *FEMALE*-flowers consisting of a 3-celled pedicelled ovary in the centre of the involucre, also without floral envelopes ; styles 3, free or connate, stigmas simple or 2-fid. *Fruit* a capsule of three 2-valved cocci separating elastically from a persistent axis and dehiscing ventrally or both ventrally and dorsally. *Seeds* albuminous ; cotyledons broad, flat.—Species about 600, chiefly in subtropical and warm temp. regions.

Stems not developed above ground ; leaves all radical.—A dwarf perennial glabrous herb . 1. *E. acaulis*.

Stems well developed above ground ; leaves not all radical :—

Shrubs or small trees with thick fleshy and often prickly branches :—

Branches ascending, armed with pairs of short persistent spines :—

Style-arms 2-cleft ; branches prominently 3-6-angled ; leaves few, less than 1 in. long, soon falling . . . . 2. *E. antiquorum*.

Style-arms undivided :—

Branches prominently 5-7-angled and with flat intervening spaces ; leaves 4-6 in. long . . . . 3. *E. Royleana*.

Branches terete or 5-angled ; leaves many, 6-12 in. long :—

Branches subterete, the spines arising from low distant spirally arranged tubercles . . . . .

4. *E. neriifolia*.

Branches angular, the spines arising from thick subconfluent tubercles arranged in more or less regular rows . . . . .

5. *E. ligularia*.

Branches spreading, unarmed, cylindric ; leaves none or few and small ; style-arms 2-lobed, short, recurved . . . . .

6. *E. Tirucalli*.

Annual or perennial herbs with slender erect ascending or prostrate stems, leafy throughout :—

Leaves alternate below and opposite above or all alt. except the uppermost floral leaves, exstipulate ; glands of involucre 2-horned, without a petaloid limb :—

Rootstock not proliferous ; seeds strophiolate :—

Leaves less than 2 in. long ; seeds oblong, with a whitish rugose or tuberculate testa.—An annual . . . . .

7. *E. dracunculoides*.

Leaves over 2 in. long ; seeds oblong, bluish.—An annual or perennial herb . . . . .

8. *E. Rothiana*.

Rootstock usually with proliferous shoots ; seeds globose, smooth, without a strophiole . . . . .

8. *E. prolifera*.

Leaves all opposite, stipulate or, if stipules are absent the leaf-attachments are connected by a transverse interpetiolar raised line ; glands of involucre not 2-horned :—

Glands of involucre with a prominent membranous petaloid limb :—

Floral leaves distichously imbricating and concealing the involucres.

—Erect dichotomously branching herbs clothed with long soft hairs :—

Limb of glands sinuate at the apex,  
rose-coloured . . . . . 9. *E. elegans*.

Limb of glands pectinate . . . . . 10. *E. cristata*.

Floral leaves not distichously imbricating; involucres in many-flowered cymes; leaves serrulate; capsule hairy . . . . . 11. *E. hypericifolia*.

Glands of involucræ with a narrow wing or wingless :—

An erect or ascending herb 6-20 in. high, hispid with crisped hairs; leaves  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, acute . . . . . 12. *E. hirta*.

Prostrate herbs; leaves less than  $\frac{1}{2}$  in. long, rounded or retuse at the apex :—

Stems more or less hispidly hairy; capsule pubescent or hirsute :—

Leaves crenulate; capsule pubescent; seeds furrowed . . . . . 13. *E. thymifolia*.

Leaves entire; capsule hirsute; seeds pitted . . . . . 14. *E. granulata*.

Stems and capsule glabrous :—

Leaves about as broad as long; seeds smooth . . . . . 15. *E. microphylla*.

Leaves much longer than their breadth; seeds obscurely transversely rugose . . . . . 16. *E. Clarkeana*.

1. *E. acaulis*, Roxb. Hort. Beng. (1814) 36; Fl. Ind. ii, 472; Cooke Fl. Bomb. ii, 562. E. fusiformis, Buch.-Ham. ex Don Prod. (1825), 62; F. B. I. v, 257; Prain Beng. Pl. 923. E. nana, Royle Ill. 329, t. 82, f. 2 & 3.—Vern. Ban muli (Rohilkhand).

A dwarf unarmed glabrous herb. *Stem* reduced to a long stout underground cylindric rootstock 6-18 in. long or more. *Leaves* all radical, subsessile, fleshy, glabrous, 6-8 in. long, obovate or oblanceolate, obtuse or subacute, base cuneate, margins curled, nerves not showing. *Cymes* from the crown of the rootstock and appearing after the leaves have fallen, dichotomously branched, very variable in length, 3-many-fld.; bracts ovate, or the upper or all truncate and 3-fid.; *Involucres* about  $\frac{1}{2}$  in. long, subsessile or on peduncles of variable length, hemispheric; lobes spathulate, fimbriate. *Capsule*  $\frac{1}{2}$  in. in diam., pedicels  $\frac{1}{2}$  in. long. *Cocci* compressed, styles connate to the middle. *Seeds* broadly ovoid, subacute, smooth.

Siwalik range from Dehra Dun and Saharanpur eastwards along the Sub-Himalayan tracts to N. Oudh and Gorakhpur (Royle, Falconer, T. Thomson, Duthie and others). It flowers during the hot season, and the leaves develop afterwards and fall off during the rains.

DISTRIB. : Tropical Himalaya up to 1,500 ft. from Garhwal to Nepal and Bengal; also in the Konkan and on the Deccan hills.

2. *E. antiquorum*, Linn. *Sp. Pl.* 450; *Roxb. Fl. Ind.* ii, 468; *Brandis For. Fl.* 438; *Ind. Trees* 558; *F. B. I.* v, 255; *Watt E. D.*; *Comm. Prod. Ind.* 530; *Gamble Man.* 590; *Prain Beng. Pl.* 923; *Cooke Fl. Bomb.* ii, 563.—*Vern. Tidhara-sehnd.*

A large shrub or small tree 15-30 ft.; trunk stout, cylindric or fluted; bark thick, rough, brown; branches many, jointed, fleshy, green, more or less whorled when young, prominently 3-(sometimes 4-6)-winged, the wide fleshy wings sinuately repand-crenate, narrowed towards the joints and armed with pairs of persistent spines at the protuberances of the angles. *Leaves* few, soon deciduous, shortly petioled,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, obovate-oblong; tip rounded or subtruncate, crenate; nerves obscure. *Involucres* ternate, forming short peduncled cymes in the sinuses, hemispheric, nearly  $\frac{1}{2}$  in. broad, yellow; the two lateral ones on thick pedicels, the central one sessile and female; bracteoles many, fimbriate. Glands 5, large, broader than long. *Capsule* about  $\frac{1}{2}$  in. in diam.; cocci compressed, glabrous; styles 2-fid.

Occasionally met with in village hedges, and sometimes in gardens as a cultivated plant. DISTRIB. : Throughout the hotter parts of India and in Ceylon; also in Burma and the Andaman Islands. It is largely used for hedges, and the wood is believed by Indian peasants to possess the power of warding off lightning strokes. The acrid milky juice supplies remedies for a great variety of ailments.

3. *E. Royleana*, Boiss. in *DC. Prod.* xv, part 2, 83; *Brandis For. Fl.* 438; *Ind. Trees* 558; *F. B. I. v.* 257; *Watt E. D.*; *Comm. Prod. Ind.* 531; *Kanjilal For. Fl.* ed 2, 343; *Gamble Man.* 591; *Collett Fl. Siml.* 446. *E. pentagona*, *Royle Ill.* 329, t. 82, fig. 1.—*Vern. Thor* (*N. Ind.*), *thuor* (*Dehra-Dun*), *Sihund* (*Kumaon*).

An erect glabrous fleshy cactus-like shrub up to 16 ft. high and with a girth of usually 2-3 ft., or occasionally up to 5 ft. *Branches* with 5-7 prominent angles and 5-7 broad flat intervening faces; the spines in pairs on the protuberant portions of the undulating edges. *Leaves* few, inserted on the angles of the branches, alternate, sessile, soon falling off, 4-6 in. long, spatulate, rounded and shortly mucronate at the apex, tapering to the base; main lateral nerves quite indistinct until dry. *Involucres* hemispheric, greenish-yellow, about  $\frac{1}{2}$  in. across, arranged 3 or more together in axillary sub-sessile cymes; lobes cuneate, fimbriate. *Styles* free nearly to the base. *Capsules* about  $\frac{3}{4}$  in. diam., trigonous, on pedicels up to  $\frac{1}{2}$  in. long; *cocci* compressed, glabrous.

Siwalik range, and on exposed rocky slopes on the northern side of Dehra Dun. In flower and fruit during the hot season, the new leaves appearing during the rains. *DISTRIB.*: Outer ranges of the W. Himalaya from Kumaon to the Jhelum ascending to 6,000 ft.; also on the Salt range of the Punjab. The plant is easily propagated and is often used for hedges; and the white dry wood affords abundant fuel. Although the milky juice of this plant contains a considerable amount of *guttapercha*, the attempts to extract it with profit have hitherto failed. The acrid juice is often used medicinally.

4. *E. neriifolia*, Linn. *Sp. Pl.* 451; *Royle Ill.* 328; *Cooke Fl. Bomb.* ii, 564; *E. Nivulia*, *Buch-Ham.* in *Trans. Linn. Soc.* xiv, 286; *Wight Ic.* 1862; *Brandis For. Fl.* 439; *Ind. Trees* 558; *F. B. I. v.* 255; *Kanjilal For. Fl.* (ed. 2), 345; *Gamble Man.* 590; *Prain Beng. Pl.* 923. *E. neriifolia*, *Willd.*; *Roxb. Fl. Ind.* ii, 467. *Rheede Hort. Mal.* ii, t. 43.—*Vern. Thor, senhur, sij.*

A large erect glabrous shrub or small tree up to 20 ft. or more; trunk cork-like when old. *Branches* fleshy, cylindric, not ribbed, subverticilled, with pairs of sharp persistent spines arising from low conical truncate distant spirally arranged tubercles. *Leaves* alternate, fleshy, clustered towards the ends of the branches, sessile or nearly so, 4-8 in. long, obovate or obovate-oblong or linear, rounded at the apex and often mucronate, tapering towards the base, deciduous; midrib prominent beneath, lateral nerves obscure. *Involucres* ternate, form-

ing small shortly peduncled solitary or twin 3-flowered cymes from above the leaf-scars on the tubercles, the central flower of each cyme usually male, sessile, and the first to appear, the 2 lateral ones male or 2-sexual and pedicelled; lobes of involucres large, erect, ovate, fimbriate; glands transversely oblong; bracteoles numerous, fimbriate. *Capsule*  $\frac{1}{2}$  in. broad; styles connate to the middle, undivided. *Seeds* smooth.

Dry rocky hills of Merwara and in the Ajmere country (possibly wild). It is used for hedges in Dehra Dun and probably elsewhere in the Upper Gangetic Plain. The plant flowers and ripens seed during the hot season, and the new leaves appear during the rains. *DISTRIB.* : Outer ranges of N. W. Himalaya on dry exposed rocks; also in Bengal, Sind and Gujarat, extending to S. India and Burma; cultivated elsewhere.

5. *E. ligularia*, Roxb. *Hort. Beng.* 36; *Fl. Ind. ii*, 465; *Royle Ill.* 328; *Cooke Fl. Bomb. ii*, 563. *E. nerifolia*, Dalz. and Gibbs. (not of Linn.); *F. B. I. v*, 255; *Watt E. D.*; *Comm. Prod. Ind.* 530; *Gamble Man.* 590; *Prain Beng. Pl.* 923; *Brandis For. Fl.* 439; *Ind. Trees* 558.—*Vern. Sehund, mansa-sij.*

An erect fleshy glabrous shrub or small tree up to 20 ft. high. *Branches* scattered, ascending, the younger ones 5-sided and angled and with short sharp black persistent spines arising from thick tubercles which are arranged in 5 irregular rows. *Leaves* alternate, fleshy, from near the ends of the branches, 6-12 in. long, obovate-oblong or subspatulate obovate, acute, deciduous, base narrowed into a short petiole, margins undulate. *Involucres* hemispheric, yellowish, smooth, arranged in small stout dichotomous shortly peduncled 3-15-flowered cymes; the lateral ones of the cymes with short thick pedicels, the central sessile and usually male; lobes large, erect, roundish, fimbriate, glands transversely oblong; bracteoles very many, fimbriate. *Styles* connate above the middle, stigmas capitate. *Capsules* deeply 3-lobed, about  $\frac{1}{2}$  in. broad. *Cocci* compressed, glabrous.

On waste land near villages, but not truly wild within the area of this flora. The leaves drop off in the autumn, the new ones appearing again in May after the plant has flowered. *DISTRIB.* : Rocky places in Orissa, the Deccan, S. India, Ceylon, also in Baluchistan and in the Malay Islands, elsewhere cultivated and often used for fences. The milky juice of this plant is used medicinally, and the root mixed with pepper is regarded as an antidote for snake bites. The plant is sacred to Mansa, the goddess of serpents.

6. *E. dracunculoides*. Lamk. *Encycl. Method.* ii, 428; *Roxb. Fl. Ind.* ii, 474; *F. B. I. v*, 262; *Watt E. D.*; *Prain Beng. Pl.* 924; *Cooke Fl. Bomb. ii*, 564.

A glabrous dichotomously much-branched annual. *Stems* many, erect, leafy, 12-18 in. high. *Leaves* sessile,  $1\frac{1}{4}$ - $2\frac{3}{4}$  in. long, linear or linear-lanceolate, subacute; base acute, rarely rounded or subcordate; floral leaves shorter, broader at the base. *Involucres* subsessile, solitary, broadly campanulate,  $\frac{1}{10}$  in. across, glabrous outside, hairy within; lobes ovate, ciliolate; glands semi-lunate. *Filaments* pubescent. *Capsules* smooth,  $\frac{1}{2}$ - $\frac{3}{4}$  in. diam.; styles free to the base, shortly 2-fid. *Seeds*  $\frac{1}{2}$  in. long, ellipsoid, rounded at the base, grooved on one side and with a strophiole at the oblique depressed apex; testa whitish, leprosus, rugose or tuberculate.

N. W. India (Royle), Moradabad (T. Thomson), Sub-Himalayan tracts in Rohilkhand and N. Oudh (Duthie), Bundelkhand (Mrs. Bell). Usually in cultivated ground. Flowers April to June. *DISTRIB.*: Plains of Punjab and Bengal, and southwards to Kanara and Coromandel; also in Arabia and Trop. Africa.

7. *E. Rothiana*, Spreng. *Syst.* iii, 796; *F. B. I. v*, 263; *Cooke Fl. Bomb. ii*, 564. *E. glauca*, *Roxb. Fl. Ind. ii*, 473.

An erect glaucous annual or perennial herb. *Stem* 1-2 ft. high, glabrous, terete, copiously branched above, often tinged with red; branches slender, some in whorls from the upper axils, others in a whorled umbellate crown from the top of the stem, all again dichotomously branched. *Leaves* of the stem alternate, sessile,  $2\frac{1}{2}$  in. long, linear-lanceolate or oblanceolate, acute, mucronulate, entire, glabrous, tapering to the base; leaves beneath the whorled crown of branches 4, sessile, radiating, broader than those of the stem; floral leaves (bracts) beneath the dichotomous forks opposite, broadly ovate or orbicular, acute, mucronate, rounded at the base. *Involucres* solitary in the upper axils and terminal,  $\frac{1}{10}$  in. across, campanulate, glabrous or hairy outside, villous within; pedicels short; lobes subquadrate, ciliate; glands crescent-shaped. *Capsules* about  $\frac{1}{2}$  in. in diam., glabrous; styles  $\frac{1}{10}$  in. long, free almost to the base, 2-fid. at the apex. *Seeds*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, semicylindric, rounded at the base, grooved on one side and with a fleshy rugulose strophiole at the oblique depressed apex, smooth, bluish-grey when ripe.

Bundelkhand on black soil (Edgeworth). *DISTRIB.*: Hills of Central and Southern India and in the Bombay Presidency; also in Ceylon.

8. *E. prolifera*, Buch.-Ham. ex Don Prod. 62; F. B. I. v, 264; Collett Fl. Siml. 447. *E. cuneifolia*, Roxb. Fl. Ind. ii, 471.

A glabrous perennial herb. *Stems* many, up to 1 ft. high, erect from a stout woody rootstock, often emitting from near the base proliferous barren shoots bearing very narrow acute leaves. *Stem-leaves* alternate, sessile, coriaceous, 1-3 in. long, narrowly linear or linear-oblong or spatulate, obtuse or acute; upper or floral leaves sometimes oblong or ovate; nerves 3, very slender. *Involucres*  $\frac{1}{8}$  in. in diam. shortly campanulate; lobes triangular, fimbriate, glabrous on both sides; glands yellow, stalked, peltate reniform or crescent-shaped, the horns usually short and blunt, the intervening margins entire or toothed, bracteoles many. *Capsule*  $\frac{1}{4}$  in. in diam., smooth; styles connate below the middle. *Seeds* globose, smooth.

Dehra Dun (Gamble), Moradabad (T. Thomson), Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). *DISTRIB.* : Punjab Plain, Central and W. Himalaya from Nepal to Kashmir ascending to 6,000 ft. in Kumaon, also in China.

9. *E. elegans*, Spreng. Syst. iii, 794; F. B. I. v, 246; Cooke Fl. Bomb. ii, 566.

A dichotomously branched annual, 1-2 ft. high, clothed with long soft spreading hairs. *Leaves* opposite, crowded or in distant pairs, sub-sessile,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, broadly elliptic-oblong, often obliquely so, obtuse, serrulate towards the tips; stipules minute, setaceous; floral leaves up to  $\frac{1}{2}$  in. long, broadly elliptic or obovate, closely imbricating and forming short spikes at the ends of the branches. *Involucres*  $\frac{1}{4}$  in. long, turbinate, hairy on both sides; limb  $\frac{1}{8}$  in. or more; lobes pink, obovate-cuneate, sinuate at the tip. *Capsule* hairy, cocci globose; styles elongate, 2-fid. *Seeds* quadrangular, transversely grooved, glabrous.

Malwa near Indore, in black soil (Edgeworth). *DISTRIB.* : Central and W. India; found on rocks, and often as a weed of cultivation.

10. *E. cristata*, Heyne ex Roth Nov. Sp. 226; F. B. I. v, 247; Prain Beng. Pl. 924.

An annual herb, clothed with long flexuous hairs. *Stem* slender, 6-10 in. long, prostrate or ascending, dichotomously branched. *Leaves* slightly hairy on both surfaces, opposite, subsessile, membranous,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, obliquely ovate-cordate, obtuse, serrulate upwards, stipules short, subulate. *Floral leaves* suborbicular, distichously

imbricate in a rounded head. *Involucres* subsolitary,  $\frac{1}{2}$  in. in diam., pubescent, throat ciliate, lobes linear-lanceolate, limb of glands pectinately laciniate and fimbriate. *Cocci* globose. *Seeds* with 3 or 4 parallel furrows, white.

Bundelkhand (Duthie) usually in cultivated ground ; C. India at Mandu (Edgeworth). This latter locality is just within the southern boundary of the area of this flora. *DISTRIB.* : W. Behar, S. India, Ceylon and extending to Ava.

**11. *E. hypericifolia*,** *Linn. Sp. Pl. ed. 1, 454 ; F. B. I. v, 249 ; Watt E. D. ; Collett Fl. Siml. 445, fig. 145 ; Prain Beng. Pl. 924 ; N. E. Brown in Fl. Trop. Afr. vi, 498 ; E. pilulifera, Linn. l. c. E. indica, Lamk. E. uniflora, Roxb. Fl. Ind. ii, 472. E. parviflora Roxb. l. c.*

An erect decumbent annual, 3-18 in. long, branching at the base, glabrous or puberulous. *Leaves* shortly stalked, opposite,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, very variable in shape from linear-oblong to elliptic-ovate, subacute to rounded or retuse at the apex ; base obliquely rounded or cordate ; margins minutely serrulate, rarely entire, puberulous or glabrous on one or both sides ; stipules minute or none. *Cymes* axillary,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., laxly few-flowered or densely many-flowered ; peduncles  $\frac{1}{10}$ - $\frac{3}{4}$  in. long, often with a pair of leaves at the apex. *Involucres* very minute, cup-shaped ; glands orbicular or transversely elliptic, entire, green, bordered by a conspicuous white or pink rounded limb. *Capsule*  $\frac{1}{10}$  in. in diam., pubescent or glabrous ; styles short, deeply bifid. *Seeds* ellipsoid, 4-angled, transversely rugose, reddish-brown with a glaucous hue.

Abundant within the area of this flora as a weed in waste places, flowering all through the year. *DISTRIB.* : Throughout the hotter parts of India, ascending to 4,500 ft. on the Himalaya ; widely dispersed in all warm regions.

**12. *E. hirta*,** *Linn. Sp. Pl. ed. 1, 454 ; Roxb. Fl. Ind. ii, 472 ; N. E. Brown in Fl. Trop. Afr. vi, 496. E. pilulifera, Jacq. (not of Linn.) ; F. B. I. v, 250 ; Watt E. D. ; Comm. Prod. Ind. 531 ; Prain Beng. Pl. 925 ; Cooke Fl. Bomb. ii, 568.*

An annual with erect or ascending stems up to 2-ft. high, clothed with long often yellowish crisped hairs ; branches often 4-angled. *Leaves* opposite, shortly stalked,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, elliptic-oblong obovate or oblong-lanceolate, acute or subacute, dentate or serrulate, dark-green.

above, pale beneath; base narrow, obliquely cordate; main nerves few, distinct; stipules pectinate, soon falling. *Involucres* many, stalked, less than  $\frac{1}{20}$  in. long, crowded in small axillary shortly stalked cymes; glands minute, globose, limb very small or obsolete. *Capsule*  $\frac{1}{20}$  in. in diam., appressedly hairy. *Seeds*  $\frac{1}{10}$  in. long, ovoid, trigonous, minutely rugose, reddish-brown.

An abundant weed within the area of this flora, flowering during the greater part of the year. *DISTRIB.*: Throughout the hotter parts of India; also in Ceylon and in nearly all tropical and subtropical regions. The plant has medicinal properties similar to those of *E. thymifolia*.

**13. *E. thymifolia*, Linn. Sp. Pl. 454; Roxb. Fl. Ind. ii, 473; F. B. I. v, 252; Watt E. D.; Collett Fl. Siml. 446; Prain Beng. Pl. 925; Cooke Fl. Bomb. ii, 569.**

A small annual herb, more or less hispidly pubescent, the whole plant often with a pale coppery tinge. *Stems* prostrate, and usually closely flattened on the ground, 4-12 in. long, divaricately branched, slender, cylindric. *Leaves* very small, opposite, petioled,  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, obliquely oblong, obtuse, crenulate, glabrous above, glaucous and usually slightly pubescent beneath; stipules elongate, fimbriate. *Involucres* minute, axillary, solitary or 2-3 together in the axils, campanulate, very shortly stalked; glands very minute, or none, limb none. *Capsules* erect, shortly stalked,  $\frac{1}{16}$  in. broad, obtusely keeled, pubescent. *Seeds*  $\frac{1}{20}$  in. long, quadrangular, bluntly pointed and with 5-6 shallow transverse furrows.

Very common within the area, and often a conspicuous garden weed especially on gravel-walks, flowering during the greater portion of the year. *DISTRIB.*: Throughout the greater part of India and in Ceylon, ascending to over 5,000 ft. on the Himalaya. It is found also in all hot countries except Australia. The leaves and seeds are said to be aromatic and astringent and the juice acts as a violent purgative. Trimen remarks that the severed end of a branch made to touch lightly the surface of water has the singular effect of violently repelling all floating particles in the neighbourhood.

**14. *E. granulata*, Forsk. *Ægypt.-Arab.* 94; F. B. I. v, 252; Watt E. D.; Prain Beng. Pl. 925; Cooke Fl. Bomb. ii, 569.**

A small hispidly hairy prostrate perennial herb. *Branches* many, 3-6 in. long, very brittle. *Leaves* opposite, shortly petioled, coriaceous,  $\frac{1}{10}$ - $\frac{1}{6}$  in. long, obliquely oblong or obovate-oblong, rounded or retuse

at the apex, quite entire, villous on both surfaces; base narrow, rounded or subcordate; stipules minute, ciliolate. *Involucres* very minute, axillary and on short leafy branchlets, sub sessile, turbinate; glands usually without a limb. *Capsule*  $\frac{1}{15}$  in. in diam., cocci hirsute, not keeled; styles very short, 2-fid. *Seeds*  $\frac{1}{30}$  in. long, 4-angled, bluntly pointed, faintly pitted, testa mucous when moistened.

Jumna ravines near Agra (Duthie); Chambal ravines near Etawah (Duthie); Rohilkhand, Bundelkhand and Malwa (Edgeworth). *DISTRIB.* : Plains of Punjab and Sind, Chota Nagpur and in S. India; extending to Afghanistan, Arabia, Egypt and the Canary Islands. The leaves are said to be often used as a pot-herb.

15. *E. microphylla*, Heyne ex Roth *Nov. Pl. Sp.* 229; *F. B. I.* V, 252; *Watt E. D.*; *Prain Beng. Pl.* 925; *Cooke Fl. Bomb. ii*, 570. *E. Chamæsyce*, Willd.; *Roxb. Fl. Ind. ii*, 473.

A subglabrous annual, or perennial (according to Roxburgh). *Stems* many, prostrate, very slender, spreading from the root and dichotomously branched, pale, glabrous, brittle. *Leaves* opposite, coriaceous,  $\frac{1}{6}$ - $\frac{1}{4}$  in. long and about as broad, obliquely oblong rounded-oblong or subquadrate, rounded truncate or retuse at the apex, entire or toothed only at the broad end, margins often pink; stipules minute, triangular, 2-partite or lacinately toothed. *Involucres* axillary, subsolitary, minute, very shortly stalked, broadly campanulate, glabrous; lobes triangular, apiculate; glands very shortly stalked and with a very small limb. *Capsule* glabrous,  $\frac{1}{15}$  in. in diam., obtusely keeled; styles short, deeply 2-fid. *Seeds* less than  $\frac{1}{30}$  in. long, obtusely 4-angled, blunt at the apex, pale-brown, smooth, mucous when moistened.

Bundelkhand (Edgeworth); Sub-Himalayan tracts of N. Oudh in the districts of Gonda, Bahraich and of Gorakhpur (Duthie); on the banks of the Ganges (Madden). *DISTRIB.* : Bengal, Behar, Konkan, Madras, extending to Burma and Java.

16. *E. Clarkeana*, Hook. f. *F. B. I. v*, 253; *Cooke Fl. Bomb. ii* 570. *E. granulata*, (Herb. Royle). *E. Heyneana*, Boiss. (in part).

A glabrous annual. *Stems* many, 3-8 in. long, usually prostrate and spreading. *Leaves* opposite,  $\frac{1}{6}$ - $\frac{1}{4}$  in. long, very shortly stalked, dichotomously spreading, coriaceous and glabrous, often crowded towards the ends of short branchlets, obliquely linear-oblong, entire or toothed at the rounded apex, glabrous, base almost auricled on one side; stipules rather large, setaceous from a broad toothed base. *Involu-*

cles axillary, solitary,  $\frac{3}{10}$  in. long, campanulate, glabrous; lobes lanceolate, toothed; glands minute, without a limb. Capsule glabrous,  $\frac{1}{16}$  in. in diam., cocci keeled. Seeds  $\frac{1}{10}$  in. long, acutely 4-angled and with a blunt point, obscurely transversely rugose, pale-brown, mucous when moistened.

Jumna ravines in the Meerut district (Duthie). DISTRIB.: N. W. India (Royle), and from Delhi to Lahore (Herb. Kew); also in Sind and the W. Peninsula.

E. *TIRUCALLI*, Linn.; Roxb. *Fl. Ind.* ii, 470; *Brandis For. Fl.* 439; *Ind. Trees* 558; *F. B. I.* v, 254; *Watt E. D.*; *Comm. Prod. Ind.* 531; *Prain Beng. Pl.* 924; *Gamble Man.* 591; *Cooke Fl. Bomb.* ii, 570.—Vern. *Sehnd.* Usually known to Europeans as the "Milk-bush". A shrub or small tree up to 20 ft. high, with very smooth spreading terete rush-like almost leafless branches. Originally introduced from Tropical E. Africa the plant has become naturalized in many of the drier parts of India. It is a very useful hedge-plant, for by reason of its acrid milky juice cattle refuse to touch it. The wood is not attacked by insects, and being fairly strong and close-grained it is often used for rafters, also a good charcoal suitable for blasting powder can be prepared from it.

E. *PULCHERRIMA*, Willd. Is the well-known *Poinsettia* so extensively grown in gardens throughout the hotter parts of India on account of its large, very handsome crimson or whitish upper floral leaves. It is a native of Mexico.—*Poinsettia pulcherrima*, R. Grub.

E. *SPLENDENS*, Boj. Is a small very prickly and much-branched shrub with very showy crimson flowers. It is largely grown in the gardens of Upper India and makes a pretty hedge. It is a native of Madagascar.

E. *GENICULATA*, Orteg. Is an annual herb introduced from Trop. America. It is often met with as a weed in Indian gardens. The narrow floral leaves are green towards the apex and almost white near the base.

## 2. BISCHOFIA, Blume; *Fl. Brit. Ind.* V, 344.

A large tree. Leaves alternate, 3-foliate, leaflets often crenate. Flowers minute, dioecious, in axillary or lateral panicled racemes; males scattered or clustered, the females with longer pedicels.

*Petals* and disk none. *MALE-flowers.* *Sepals* 5, concave, obtuse, imbricate, concealing the anthers. *Stamens* 5, filaments short, anthers large, cells parallel. *Fistillode* short, broad. *FEMALE-flowers.* *Sepals* 5, ovate, caducous. *Staminodes* small or none. *Ovary* exserted, 3-4-celled; styles long, stout, entire, stigmatic on the inner face, ovules 2 in each cell. *Fruit* a globose fleshy berry with 3-4 cells, lined with a parchment-like 2-valved endocarp. *Seeds* turgidly oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat; radicle straight, elongate.—A single species, confined to India and China and to the Malay and Pacific Islands.

**B. javanica**, Blume *Bijdr. 1168*; *Brandis For. Fl. 446*; *Ind. Trees 558*; *F. B. I. v. 345*; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2) 351*; *Gamble Man. 607*; *Prair. Beng. Pl. 926*; *Cooke Fl. Bomb. ii, 571*. *Andracrine trifoliata*, Roxb. *Fl. Ind. iii, 728*; *Royle Ill. 327*.—*Vern. Kain, kein* (Hind.), *paniála* (Dehra Dun), *irum* (Oudh).

A large very handsome quick-growing deciduous tree; trunk erect, 30-40 ft. high and often of considerable girth; bark rough, dark-grey; branches spreading, forming a large shady oval head. *Leaves* alternate; common petiole 3-6 in. long, terete; leaflets 3-6 in. long, elliptic, acuminate, crenate, glabrous; main lateral nerves 6-8 pairs; stalks of the lateral leaflets  $\frac{3}{5}$ - $\frac{5}{8}$  in., that of the terminal leaf up to  $1\frac{1}{2}$  in. long, channelled; stipules and stipels caducous. *Flowers* greenish-yellow, arranged in slender axillary and lateral peduncled racemes. *MALE-flowers* on very short slender pedicels. *Sepals*  $\frac{1}{10}$  in. long, *Anthers* globular. *Fem.-flowers* on pedicels longer and stouter than those of the male and elongating in fruit. *Sepals*  $\frac{1}{10}$  in. long, not persistent. *Styles* nearly  $\frac{1}{3}$  in., linear. *Fruit*  $1\frac{1}{2}$  in. in diam., reddish-brown when ripe. *Seeds*  $\frac{1}{2}$  in. long, brown, shining.

Moist shady ravines and in swampy places in Dehra Dun and eastwards along the Sub-Himalayan tracts, common in the forests of Gonda and Gorakhpur. The new leaves appear in February and March, and they turn red before falling. It flowers during April and May. *DISTRIB.*: Outer ranges of Himalaya from Kumaon eastwards; also in Assam, Burma, Bengal, W. Ghats and southwards to the Nilgiris, but not in Ceylon; found also in the Malay and Pacific Islands. The reddish close-grained wood is much valued for its durability under water and is largely used in the making of bridges and in some parts of India for boat-building.

## 3. BRIDELIA, Willd.; Fl. Brit. Ind. V, 267.

Shrubs or trees. *Leaves* alternate, quite entire, sometimes with strong straight nerves and prominent veins. *Flowers* small or minute, monococious or dicecious, arranged in axillary or spicate clusters, sessile or very shortly pedicelled; bracts small, scale-like. *MALE*-flowers numerous. *Perianth* double. *Calyx-segments* 5, valvate. *Petals* 5, short, scale-like, stalked or spatulate. *Disk* broad, pulvinate or adnate to the calyx-tube. *Stamens* 5; filaments united below in a column which bears a terminal pistillode, free and spreading above; anther-cells 2, parallel. *FEMALE*-flowers few or solitary. *Calyx-segments* usually narrower than in the male. *Disk* double, the inner forming a membranous central truncate cone often enclosing the young ovary. *Ovary* 2 (rarely 3)-celled, glabrous; styles free or shortly united below, forked or subentire. *Fruit* a small drupe with one or two usually 1-seeded cocci or pyrenes. *Seed* with usually fleshy sometimes membranous albumen, cotyledons thin or fleshy.—Species about 30, in Trop. Asia, Africa and Australia.

Flowers dicecious; leaves deciduous; main lateral nerves 15-20 pairs, straight, prominent; drupe globose.—A small tree with stout more or less persistent spines

1. *B. retusa*.

Flowers monococious; leaves persistent; nerves more or less arching:—

Leaves glabrous or slightly tomentose beneath, but not glaucous; main lateral nerves 10-15 pairs; calyx in fruit not enlarged; drupe fusiform.—A small tree

2. *B. montana*, var. *communis*.

Leaves pubescent beneath, or if at length glabrous then glaucous beneath; main lateral nerves 6-9 pairs; calyx in fruit distinctly enlarged; drupe oblong.—A scandent sometimes spinose shrub

3. *B. stipularis*.

1. *B. retusa*. Spreng. Syst. Veg. iii, 48; Brandis For. Fl. 449, t. 55; Ind. Trees 560; F. B. I. v, 268; Watt. E. D.; Kanjilal For. Fl. (ed. 2) 345; Gamble Man. 595; Prain Beng. Pl. 927; Cooke

*Fl. Bomb. ii.*, 572. *B. spinosa*, *Willd.*; *Roxb. Fl. Ind. iii.*, 735.—  
Vern. *Káj*, *kája* (Hind.), *lamkana* (Ajmir), *gaya* (Dehra Dun).

A small or moderate-sized erect deciduous tree, more or less spinescent when young; bark grey. *Leaves* coriaceous, elliptic-oblong, ovate or obovate, acute, obtuse or rounded at the apex, the base usually rounded, bright-green and glabrous on the upper surface and turning pinkish-purple before falling, often finely tomentose beneath; main lateral nerves 15-25 pairs, straight, prominent, finely reticulate between; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, stipules ovate-lanceolate, unequal at the base, deciduous. *Flowers* diœcious, greenish-yellow, sessile or shortly pedicelled, arranged in dense axillary clusters or in long axillary or terminal panicled spikes exceeding the leaves; bracts small, obtuse, villous. *Calyx*  $\frac{1}{8}$  in. in diam.; lobes fleshy, spreading-triangular-ovate, acute, glabrous and often tinged with red; tube pubescent. *Petals* of males obovate, pectinate; of the fem. subspatulate. *Disk* of male flower thick and pulpy; of the fem. truncate, enclosing the ovary. *Drupe* fleshy, subglobose,  $\frac{1}{8}$  in. in diam., seated on the persistent hardly enlarged calyx, flesh-coloured or purplish-black when quite ripe.

Siwalik range (T. Thomson); forests of Dehra Dun and Saharanpur, often associated with *sál*; plentiful in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand and Rajputana. *Flowers* May-July, and the fruit ripens in the cold season. *DISTRIB.*: Outer Himalayan ranges from Kashmir to Mishmi up to 3,500 ft., and southwards to S. India and Ceylon, extending to Burma and Malacca. The wood is much valued for various purposes, and it lasts well under water; the bark is used for tanning, the sweetish fruit is eaten, and the leaves afford good fodder for cattle. An earlier name for this plant under *Bridelia* is *B. spinosa*, *Willd.*—See Cooke *Fl. Bomb.* l. c.

2. ***B. montana***, *Willd. Sp. Pl. iv.*, 978, var. *communis*, *Frain Beng. Pl.* 928. *B. montana*, *Royle Ill.* 327 (not of *Willd.*); *Brandis For. Fl.* 450; *Ind. Trees* 560, *F. B. I. v.*, 269; *Watt E. Dl. Kanjilal For. Fl.* (ed. 2) 346; *Gamble Man.* 596; *Collett Fl. Sim.* 448.—Vern. *Gondni* (Saharanpur).

A small or moderate-sized glabrous deciduous tree; trunk short, with a low spreading crown; bark dark-grey; branchlets often warted. *Leaves* membranous, very variable, 4-7 in. long, obovate-oblong or broadly obovate, obtuse acute or abruptly mucronate, entire, often shining above, paler beneath, but not glaucous; main lateral nerves

8-15 pairs, slightly arched; petioles  $\frac{1}{10}$ - $\frac{1}{5}$  in. long, stipules deciduous. *Flowers* monœcious, small, greenish-yellow, shortly pedicelled and arranged in dense axillary clusters; bracts many, very short, ciliate. *Calyx*  $\frac{1}{8}$ - $\frac{1}{6}$  in. in diam.; lobes triangular-ovate, not enlarging in fruit. *Petals* broadly ovate, entire. *Fruit*  $\frac{1}{5}$  in. long, ovoid-oblong or fusiform.

Dehra Dun and in the ravines of the Siwalik range; forests of N. Oudh. Flowers in April and May. *DISTRIB.*: Along the base of the W. Himalaya from the Jhelum to Kumaon, ascending to 4,000 ft.; also in Bengal the Khasia Hills and in Upper Burma. The foliage is lopped for cattle-fodder.

**3. *B. stipularis* Blume *Bijdr.* 597; *Brandis For. Fl.* 449; *Ind. Trees* 560; *F. B. I. v.* 270; *Watt E. D.*; *Gamble Man.* 596; *Frain Beng. Pl.* 928; *Cooke Fl. Bomb. ii.*, 573. *B. scandens*, *Willd.*; *Roxb. Fl. Ind. iii.*, 736.—*Vern. Madlatah, undergupa* (Oudh).**

A large more or less scandent evergreen shrub with dark-grey or brownish bark. *Stem* 2-8 in. in diam.; branches often with long deflexed spines, the young shoots pubescent or fulvous-tomentose. *Leaves* subcoriaceous, 2-6 in. long, elliptic-oblong or obovate, obtuse or subacute, rounded or cordate at the base, glabrous or puberulous above, fulvous-tomentose beneath, margins sometimes undulate or repand; main lateral nerves 8-12 pairs, slightly arching, the transverse veins parallel and at right angles, petioles  $\frac{1}{3}$  in. long. *Flowers* monœcious, greenish-yellow, in small dense axillary clusters or long spikes which are often subtended by hairy obliquely ovate-lanceolate acute stipule-like bracts  $\frac{1}{8}$  in. long; male-flowers sessile; females pedicelled, pubescent or glabrate. *Calyx*  $\frac{1}{6}$  in. in diam., distinctly enlarging in fruit; lobes connate below, lanceolate-acuminate. *Petals*  $\frac{1}{10}$  in. long, suborbicular, shortly cuneate at the base, crenulate towards the apex. *Drupe* nearly  $\frac{1}{2}$  in. long, oblong, obtuse, smooth, bluish-black and juicy when ripe.

Sub-Himalayan tract, abundant in the *sál* forests of Oudh and Gorakhpur. *DISTRIB.*: Throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Peninsula and Islands. The earliest name of this plant under *Bridelia* is *B. scandens*, *Willd.*—See *Cooke Fl. Bomb. l. c.*

**4. *CLEISTANTHUS*. Hook. f.; *Fl. Brit. Ind. v.*, 274.**

Trees or shrubs. Leaves alternate, bifarious, entire. *Flowers* monœcious, small or minute, in axillary clusters or spikes, all sessile

or the females shortly pedicelled. MALE flowers: Calyx-segments 5, valvate. Petals 5, short, scale-like, stalked or spatulate. Disk broad, entire or sinuate. Stamens 5; filaments connate below in a central column, bearing a pyramidal or 3-lobed pistillode, free and spreading above; anther-cells parallel. FEM.-flowers: Calyx less deeply lobed than in the male, cupular under the ovary. Disk double, the inner conic or turbinate, more or less enclosing the young ovary. Ovary 3 (rarely 4)-celled, usually clothed with long hairs; ovules 2 in each cell; styles 3, free, 2-fid. Fruit a sessile or stipitate subglobose or depressed capsule with three 2-valved cocci. Seeds without an aril or arillode; albumen copious or scanty; cotyledons thin or fleshy, often folded.—Species about 30, in Tropical India, Malaya and Africa.

**C. collinus**, Benth. in Gen. Pl. iii, 268; F. B. I. v 274; Gamble Man. 597; Brandis Ind. Trees 561; Prain Beng. Pl. 928. Lebidiopsis orbicularis, Muell.-Arg.; Brandis For. Fl. 450; Watt E. D. Cluytia collina, Roxb.; Fl. Ind. iii, 732.

A small tree with a dark rough bark; branches stiff, smooth or pustulate. Leaves coriaceous,  $1\frac{1}{2}$ -4 in. long, orbicular broadly obovate or elliptic, rounded or retuse at the apex, glaucous beneath, pale when dry; main lateral nerves 5-8 pairs, very slender; petiole  $\frac{1}{4}$  in., slender. Flowers in small axillary and shortly spicate villous clusters. Calyx  $\frac{1}{4}$  in. in diam., ovate-lanceolate. Petals narrow, fleshy, incurved. Disk of male-flowers pulvinate; of the females conical with a thick margin. Ovary globose, glabrous; styles free, thick, stigmas lobed. Capsule sessile, rounded,  $\frac{3}{4}$  in. in diam., obscurely 3-lobed, dark-brown, shining and wrinkled when dry. Seeds  $\frac{1}{2}$  in. in diam., globose, reddish-brown.

Forests of Bundelkhand. Flowers in June, and the fruit ripens during the cold season. DISTRIB.: From the C. Provinces, Chota Nagpur and Circars to S. India and Ceylon. The hard and tough dark-coloured wood is much valued for posts and poles. The capsules, as well as the leaves and roots, are said to be very poisonous.

##### 5. GLOCHIDION, Forst.; Fl. Brit. Ind. v, 305.

Evergreen trees or shrubs. Leaves alternate, bifarious, shortly petioled, entire. Flowers small, in axillary clusters, monceious or dioecious. Perianth simple. Petals none. Disk none. MALE-

flowers : *Sepals* 6, rarely 5, spreading, in 2 series, imbricate. *Stamens* connate in an ellipsoid or oblong sessile column ; anthers 3-8 (or more), cells linear, bursting outwards, connectives produced as free points or connate in an umbonate head. *Pistillode* none or rarely minute. FEMALE-flowers : *Calyx* usually of 6 short imbricate sepals, or shortly tubular and unequally toothed or cleft. *Ovary* 3-15-celled ; styles connate in a globose conic or subclavate column lobed or toothed at the tip, ovules 2 in each cell. *Fruit* a capsule of three or more 2-valved cocci, often with twice as many lobes as cells, globose or orbicular and depressed or intruded at the base and apex, crowned by the enlarged style ; cocci coriaceous or crustaceous, the epicarp separable or not. *Seeds* hemispherical or laterally compressed, testa crustaceous and with often a succulent coat ; albumen copious, fleshy, cotyledons flat.—Species 135, in Asia and Polynesia.

Anthers 4 or more ; leaves glabrous beneath :—

Pedicels of male flowers stout, about  $\frac{1}{4}$  in.  
long ; leaves glaucously purplish beneath 1. *G. multiloculare*.  
Pedicels of male flowers filiform,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long ;  
leaves pale-green beneath . . . . . 2. *G. lanceolarium*.  
Anthers 3 ; leaves softly tomentose beneath . . . . . 3. *G. velutinum*.

1. *G. multiloculare*, Voigt Hort. *Suburb. Calc.* 152 ; *F. B. I. v.* 307 ; *Gamble Man.* 601 ; *Prain Beng. Pl.* 930 ; *Brandis Ind. Trees*, 572. *Bradleia multilocularis*, *Spreng.* ; *Roxb. Fl. Ind. iii*, 696.

An evergreen shrub or small tree with usually drooping branches, branchlets angular, glabrous or puberulous. Leaves thinly coriaceous, purplish-brown, 3-5 in. long, oblong, linear-oblong or obovate, obtuse or subacute, apiculate, lower surface glaucous ; main lateral nerves 5-8 pairs and with many prominent transverse veins between ; petioles stout,  $\frac{1}{10}$  in. long, stipules triangular-ovate, cuspidate. MALE-flowers small ; pedicels stout,  $\frac{1}{2}$  in. long. *Perianth*  $\frac{1}{2}$  in. in diam. *Sepals* oblong. *Anthers* 4-12, adnate to the middle, connectives very short. FEM.-flowers  $\frac{1}{2}$  in. in diam., stoutly pedicelled. *Ovary* 10-15-celled ; style low, slightly furrowed. *Capsule* orbicular,  $\frac{3}{4}$ -1 in. in diam. ; epicarp thin, reddish, separating from the coriaceous cocci. *Seeds* persistent on the axis, furnished with a fleshy orange-red coat.

Abundant in the grass-lands of the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. DISTRIB.: N. Behar, Sikkim Terai, Assam, Sylhet and Upper Burma.

2. *G. lanceolarium*, Voigt Hort. Suburb. Calc. 153; F. B. I. v, 308; Watt E. D.; Kanjilal For. Fl. (ed. 2), 348; Gamble Man. 601; Prain Beng. Pl. 930; Cooke Fl. Bomb. ii, 577; Brandis Ind. Trees 573. *Phyllanthus lanceolarius*, Muell. Arg.; Brandis For. Fl. 453. *Bradleia lanceolaria*, Roxb. Fl. Ind. iii, 697.

A small or medium-sized glabrous evergreen tree; bark grey, with longitudinal wrinkles; branchlets angular, glabrous. Leaves coriaceous, glabrous and shining, 3-6 in. long, elliptic-oblong or lanceolate, acuminate, pale-green beneath, base acute, decurrent on the petiole; main lateral nerves 6-10 pairs, slender; petioles  $\frac{1}{2}$ - $\frac{1}{3}$  in., stout, channelled; stipules triangular, acuminate. Flowers pale-green. MALE-flowers many, glabrous, on filiform pedicels  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. Sepals  $\frac{1}{6}$  in. long, linear-oblong. Anthers 4-6; connectives  $\frac{1}{4}$  the length of anthers, acute. FEM.-flowers smaller, few, sessile or nearly so, mostly in the upper axils, a few mixed with the males. Sepals unequal, lanceolate, acute, rigid, glabrous. Ovary hairy, 6-8-celled; style shortly exserted, glabrous near the toothed apex. Capsule hoary, about  $\frac{1}{4}$  in. in diam., orbicular, depressed, usually 6-8-lobed. Seeds often persistent on the axis.

Dehra Dun, fairly common in swampy places and in moist shady ravines; also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during the cold season. DISTRIB.: Outer Himalayan ranges from Kumaon and Nepal eastwards, up to 4,000 ft.; also in Chota Nagpur, Bengal and Assam, extending to the Shan Hills and Upper Burma. Roxburgh states that it sometimes grows to be a large tree with hard and durable wood. The seeds yield an oil for burning, and the bark is used medicinally.

3. *G. velutinum*, Wight Ic. t. 1907-2; F. B. I. v, 322; Watt E. D.; Kanjilal For. Fl. (ed. 2), 348; Gamble Man. 602; Collett Fl. Siml. 451; Prain Beng. Pl. 931; Cooke Fl. Bomb. ii, 578; Brandis Ind. Trees 574. *Phyllanthus nepalensis*, Muell. Arg.; Brandis For. Fl. 453.—Vern. *Chamári* (Dehra Dun).

A small or moderate-sized tree; young branches petioles under surface of leaves and inflorescence clothed with soft velvety pubescence. Leaves thinly coriaceous, 2-4 $\frac{1}{2}$  in. long, from orbicular to elliptic-oblong or lanceolate, obtuse acute or acuminate, base usually rounded, upper surface puberulous or glabrate; main lateral nerves 6-8

pairs, prominent beneath, transverse veins distinct; petioles stout,  $\frac{1}{2}$ - $\frac{1}{10}$  in.; stipules triangular, cuspidate. Flowers small, greenish-yellow, arranged in axillary clusters, the male and female usually in the same cluster. MALE-flowers stalked. Sepals  $\frac{1}{8}$  in. long, ovate, subacute, keeled and pubescent on the back. Staminal-column  $\frac{1}{10}$  in.; anthers 3, connate below, connectives acute. FEM.-flowers sessile or nearly so, pubescent. Sepals as in male. Ovary 4-7-celled, tomentose; style longer than the ovary, enlarged at the truncate 4-7-toothed apex. Capsule  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam., orbicular-depressed, 4-7-lobed. Seeds bright-red, often persistent on the tree.

Common in the forests of Dehra Dun and Saharanpur (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers from February to April. DISTRIB.: Hot valleys of the Outer Himalaya from Kashmir eastward to Sikkim, ascending to 4,000 ft.; also Assam, Khasia Hills and Burma, and from Central India and the Deccan to the Nilgiris. The bark is used for tanning.

**6. FLUGGEA.** Willd.; Fl. Brit. Ind. v, 328.

Unarmed or spinescent shrubs. Leaves small, alternate, distichous, entire. Flowers minute, dioecious, axillary, pedicelled, apetalous; males numerous, clustered; females few, in lax fascicles, perianth simple, 5-cleft. MALE-flowers: Sepals 5, subpetaloid, imbricate. Petals none. Stamens 5, rarely 4 or 3, alternating with as many disk-glands, filaments free, anthers erect; cells parallel, bursting longitudinally. Pistillode 2-3-fid. FEMALE-flowers: Sepals as in male. Petals none. Disk flat, annular, toothed. Ovary 1-3-celled; styles 3, recurved, usually 2-fid., ovules 2 in each cell. Fruit globose, coriaceous, or with a fleshy epicarp, bursting irregularly or into distinct 2-valved cocci. Seeds triquetrous, with convex backs and acute faces, testa crustaceous, albumen scanty, embryo curved; cotyledons flat, broad.—Species 6, in the tropics of the Old World.

Unarmed; leaves 1-3 in. long . . . . 1. *F. microcarpa*.

Spinous; leaves rarely exceeding 1 in. long . . 2. *F. Leucopyrus*.

**1. *F. microcarpa*,** Blume *Bijdr.* 580; *F. B. I.* v, 328; *Kanjilal For. Fl.* (ed. 2), 349; *Gamble Man.* 603; *Collett Fl. Siml.* 451; *Prain Beng. Pl.* 931; *Cooke Fl. Bomb.* ii, 581; *Brandis Ind. Trees* 569. *Securinega obovata*, *Muell. Arg.*; *Brandis For. Fl.* 455. *Phyllanthus virosus*, *Willd.*; *Roxb. Fl. Ind.* iii, 659; *Royle Ill.* 328 (*Fluggea*).

*P. retusus*, Roxb. l. c. 657; Royle Ill. 327 (*Fluggea*).—Vern. *Dalme* (Hind.), *rithoul* (Dehra Dun).

A large unarmed glabrous shrub or small tree; bark smooth, thin, rusty or reddish-brown, marked with small lenticular specks; branchlets slender, angular, compressed. *Leaves* very variable, shortly petioled, thin, glabrous, 1-3 in. long, elliptic or obovate, rounded at the apex, rarely retuse or subacute, base usually acute; main lateral nerves 5-7 pairs, very slender; under-surface glaucous and with loose reticulate venation; petioles slender,  $\frac{1}{3}$ - $\frac{1}{2}$  in. *Flowers* very small, arranged in axillary clusters from a crowd of minute bracts; the males very many; the females 1-5, rarely more. *MALE*-flowers on filiform pedicels. *Sepals* spreading,  $\frac{1}{16}$  in. long, obovate-oblong, obtuse, concave. *Stamens* usually 5, exerted; filaments opposite the sepals, slender. *Pistillode* large, 3-fid. *FEM.*-flowers. *Pedicels* shorter than those of males. *Sepals* as in males. *Ovary* glabrous, styles deeply bifid. *Berry* globose, of two sizes, mostly minute and with a dry pericarp, a few  $\frac{1}{2}$  in. in diam. and white with a fleshy pericarp. *Seeds* 3-6, minutely punctate.

Dehra Dun, in scrub forest (Kanjilal), and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand and Merwara. Flowers in April and May. *DISTRIB.* : Hilly parts of the Punjab westwards to the Suliman range; Himalaya from Kashmir to Bhutan up to 5,000 ft., also in Bengal and in Central W. and S. India, extending to Ceylon, Burma, Malaya, China, Australia and Trop. Africa. The hard close-grained reddish wood is used for agricultural implements, and the bark is said to be used for intoxicating fish.

2. **F. Leucopyrus**, Willd. *Sp. Pl.* iv, 757; *F. B. I.* v, 328; *Gamble Man.* 603; *Brandis Ind. Trees* 569; *Cooke Fl. Bomb.* ii, 581. *Securinega Leucopyrus*, Muell. Arg.; *Brand. For. Fl.* 456, t. 54 (in part). *Phyllanthus Leucopyrus*, Koen. *Mss.*; *Roxb. Fl. Ind.* iii, 658.—Vern. *Hartho, ainta* (Brandis), *salipan* or *halepan* (Merwara).

A large glabrous bush with rigid straggling branches; branchlets slender, angular, ending in sharp spines. *Leaves*  $\frac{5}{8}$ -1 in. long, rarely longer, obovate obcordate or rotundate, glaucous and with indistinct reticulate venation beneath. *Flowers* as in *F. microcarpa*. *Berry* 3-celled, globose, about  $\frac{1}{4}$  in. in diam., smooth, white when ripe; styles 3, bifid. *Seeds* 2 in each cell.

In the Sub-Himalayan tracts of Kheri (N. Oudh) and Gorakhpur. Flowers May and June. *DISTRIB.* : Outer ranges of the Kumaon

Himalaya up to 5,000 ft. ; common also in the Punjab Plain and in Sind, extending to Kanara, the Carnatic, Ceylon and Upper Burma.

7. BREYNIA, Forst.; Fl. Brit. Ind. v, 329.

Shrubs or small trees. *Leaves* small, alternate, petioled, entire, often distichous. *Flowers* monœcious, axillary, minute ; pedicels distinct, solitary or the males in fascicles. *Perianth* simple. *MALE-flowers* : *Calyx* turbinate or hemispheric with a truncate limb ; margin often thickened and lobulate opposite the minute inflexed and rounded lobes. *Petals* none. *Disk* none. *Stamens* 3, filaments connate ; anthers slender, adnate to the whole length of the column ; cells linear, parallel, distinct. *Pistillode* none. *FEM.-flowers* : *Calyx* coriaceous, turbinate or rotate ; limb broadly and shortly 6-lobed, often much enlarged and disciform in fruit. *Petals* disk and staminodes none. *Ovary* 3-celled, fleshy above, globose truncate or depressed at the apex ; styles 3, sessile or connate in a short column, each 2-fid. or 2-lobed ; or stigmas 3, minute, simple and immersed in a cavity at the top of the ovary ; ovules 2 in each cell. *Fruit* globose or depressed, more or less succulent, indehiscent or with a 6-valved pericarp enclosing 3-6 imperforate indehiscent cocci. *Seeds* with a membranous testa, hilum without a caruncle, albumen fleshy, cotyledons broad, radicle long.—Species 12, in Trop. Asia, Africa and the Pacific Islands.

**B. rhamnoides** Muell. Arg. in DC. Prod. xv, part 2, 440 ; Brandis For. Fl. 455 ; Ind. Trees 568 ; F. B. I. v, 330 ; Watt E. D. Gamble Man. 604 ; Frain Beng. Pl. 933 ; Cooke Fl. Bomb. ii, 583. *Phyllanthus Vitis-Idœa*, Roxb. Fl. Ind. iii, 665.—Vern. Tikkar (Oudh).

A shrub or small tree, quite glabrous. *Bark* rough, yellowish-brown. *Branches* many, horizontal ; branchlets flexuous, angular. *Leaves* many, membranous, distichous, shortly stalked,  $\frac{5}{8}$ - $1\frac{1}{2}$  in. long, elliptic, obtuse or subacute, pale beneath, turning dark-brown or black when dry, base subacute or rounded ; petiole  $\frac{1}{10}$  in. ; stipules  $\frac{1}{16}$  in., subulate from a triangular base. *Flowers* very small, on filiform pedicels, the males usually in small fascicles, females generally solitary. *MALE-flowers* : *Calyx* turbinate or subcampanulate, mouth entire or obscurely lobed. *Staminal column* truncate at the apex and produced beyond the adnate anthers. *FEM.-flowers*. *Calyx* cup-shaped ; hardly enlarged in fruit ; lobes 6, acute. *Ovary* exserted, oblong,

truncate; styles very short. *Fruit* globose, about  $\frac{1}{4}$  in. in diam. smooth, succulent, dull-red or purple.

Sub-Himalayan tracts and in the forests of Oudh and Bundelkhand; abundant in open scrub lands and often met with in hedges. Flowers in April and May. *DISTRIB.*: Throughout tropical India; extending to Ceylon, Burma, China, the Malay Islands and the Philippines.

**S. PHYLLANTHUS, Linn. ; Fl. Brit. Ind. v, 285.**

Herbs, shrubs or trees. *Leaves* distichous, the branchlets with their leaves often resembling pinnate leaves, entire, stipules usually narrow or none. *Flowers* small, monococious, rarely dicecious, axillary or on the old nodes; males usually many, fascicled, subsessile or pedicelled, rarely few or solitary; females in the same or in distinct axils with longer pedicels, solitary or few; perianth simple. *MALE*-flowers: *Sepals* 4-6, free or nearly so, imbricate, more or less 2-seriate. *Disk* glandular, rarely none. *Stamens* 3, rarely 4 or 5, in the centre of the flower, filaments free or connate, anthers 2-celled, oblong or didymous, rarely reniform; cells parallel or diverging, dehiscence extrorse, vertical or transverse. *Pistillode* none. *FEM.*-flowers: *Sepals* as in male. *Petals* none. *Disk* glandular. *Ovary* usually 3-celled; styles free or connate, usually 2-fid. and with slender arms; ovules 2 in each cell. *Fruit* of 3 crustaceous or coriaceous rarely bony 2-valved cocci, sometimes a 4-celled berry or a drupe with a 3-4-celled bony epicarp. *Seeds* trigonous, testa crustaceous, hilum without a caruncle, albumen fleshy, cotyledons flat or flexuous.—Species about 400 in all warm countries.

Stamens 5, in 2 series, the 3 inner filaments connate.—A shrub, often scandent . . . . . *I. P. reticulatus.*

Stamens 3, filaments united in a column, rarely free and recurved :—

Anthers erect, slits vertical, connective usually produced :—

Fruit large, fleshy, containing 3 bony 2-valved cocci; disk absent in the male-flowers; styles connate below, twice 2-fid.—A tree . . . . . *2. P. Emblica.*

Fruit a capsule of 3 crustaceous 2-valved cocci; disk present in the male and fem. flowers; styles once 2-fid., free; stipules peltate.—Herbs:—

Leaves scattered, cuneate-obovate; capsule smooth . . . . .

3. *P. maderaspatensis.*

Leaves close-set, distichously imbricating, oblong or linear-oblong; capsule echinate . . . . .

4. *P. urinaria.*

Anthers didymous, reniform, the cells sub-globose, slits very short; fruit a capsule; styles once 2-fid., free or connate:—

Seeds finely tubercled; stipules peltate.—

A perennial herb or undershrub . . . . . 5. *P. simplex.*

Seeds with parallel ribs on the back; stipules simple, not peltate.—An annual weed . . . . .

6. *P. Niruri.*

1. *P. reticulatus* Poir. *Encycl. Méth.* v, 298; *Brandis For. Fl.* 453; *Ind. Trees* 570; *F. B. I.* v, 288; *Watt E. D.*; *Comm. Prod. Ind.* 887; *Gamble Man.* 598; *Prain Beng. Pl.* 935; *Cooke Fl. Bomb.* ii, 585. *P. multiflorus*, *Willd.*; *Roxb. Fl. Ind.* iii, 664 (*not of Roxb. Ic.*).—Vern. *Panjuli*, *kabonan* (Merwara).

A large often scandent shrub, glabrous or pubescent; branchlets slender, drooping, smooth or lenticellate; bark thin, greyish-brown. Leaves variable, thin, glabrous or nearly so, pale beneath, 1-2 in. long, oblong elliptic or rotundate, obtuse or acute at the apex; base rounded acute or subcordate; main lateral nerves 6-8 pairs, slender; petioles up to  $\frac{1}{2}$  in. long; stipules shorter than the petioles, ovate, acute, sometimes bristle-pointed. Flowers axillary, males in fascicles, the females solitary, pedicels slender. Calyx  $\frac{1}{2}$  in. long, glabrous; segments oblong, obtuse, alternating with the glands of the disk. MALE-flowers. Stamens 5, the three inner connate, the two outer free and shorter. FEM.-flowers. Ovary 5-10-celled; ovules 2 in each cell, superposed; styles 3, minute, 2-lobed. Fruit a globose berry, about  $\frac{1}{6}$  in. diam., smooth and shining, dark-purple when ripe. Seeds usually 10, trigonous, crustaceous, punctulate.

Meerut (T. Thomson), Rohilkhand (Edgeworth), N. Oudh and Gorakhpur (Duthie); often found climbing amongst bushes and in hedges.

DISTRIB. : Throughout tropical India from Sind, Bengal and Sikkim to S. India and Ceylon ; also in Burma, the Andaman Islands, Malay Archipelago, China and Trop. Africa. The leaves bark and juice are used medicinally. Manson states that the charcoal prepared from this species is much used in Burma for lighting hookas.

2. *P. Emblica*, Linn. Sp. Pl. 982 ; Roxb. Fl. Ind. iii, 671 ; Brandis For. Fl. 454, t. 52 ; Ind. Trees 570 ; F.B.I. v, 289 ; Watt E. D. ; Comm. Prod. Ind. 886 ; Kanjilal For. Fl. (ed. 2), 346 ; Gamble Man. 599 ; Collett Fl. Siml. 450 ; Prain Beng. Pl. 935 ; Cooke Fl. Bomb. ii, 585. *Emblica officinalis*, Gœrtn. ; Royle Ill. 327.—Vern. *Ambla*, *ámla*, *aonhla*, *aola*. (*Emblic myrobalan.*)

A moderate-sized deciduous tree with usually a crooked trunk ; bark light-grey, or greenish, peeling off in small irregular patches, red inside. Branches spreading, branchlets glabrous or finely pubescent, often deciduous. Leaves small, subsessile, distichously arranged along the branchlets and thus simulating the leaflets of a pinnate leaf,  $\frac{3}{4}$  to  $\frac{1}{2}$  in. long, narrowly linear, obtuse, pale-green, glabrous or puberulous beneath ; stipules minute, ovate, finely acute. Flowers greenish-yellow, arranged in axillary fascicles on the leaf-bearing branchlets or on the naked portion below the leaves ; bracts fimbriate, MALE-flowers many, shortly pedicelled. Sepals 6, oblong, obtuse,  $\frac{1}{10}$  in. long. Disk none. Anthers 3, erect, on a short column, slits vertical. FEM.-flowers few, subsessile. Sepals as in male. Disk cupular, lacerate. Ovary 3-celled ; styles connate at the base, twice 2-fid. and with acute lobes. Fruit fleshy, globose, pale-yellow and often tinged with pink when ripe, about  $\frac{1}{2}$  in. in diam., obscurely 6-lobed, breaking up when dry into three 2-seeded crustaceous cocci. Seeds 6, trigonous.

Abundant in forest tracts within the area of this flora, and often planted near villages and as a roadside tree. Flowers March to May, and the fruit ripens during the cold season. DISTRIB. : Throughout tropical and subtropical India, chiefly in the dry deciduous forests, ascending to 4,500 ft. on the Himalaya ; also in Ceylon, Burma, the Malay Islands and China. The acid fruit is eaten as a pickle, and the bark leaves and fruit are used in dyeing and tanning. The hard red wood is valued for poles and, being durable under water, it is much used for well-work. Excellent charcoal is prepared from it. It is said that chips of the wood thrown into muddy water will clear it effectually. For further particulars regarding the medicinal and other useful properties of this tree see Watt's Dictionary.

**3. *P. maderaspatensis*,** Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 654; F. B. I. v, 292; Watt E. D.; Prain Beng. Pl. 935; Cooke Fl. Bomb. ii, 586. *P. obcordatus*, Willd.; Roxb. Fl. Ind. iii, 656.—Vern. Hazarmani.

A glabrous annual but occasionally often with a woody rootstock. Stems erect, 1-3 ft., ascending or decumbent below. Leaves scattered,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, cuneate, ovate, with a rounded truncate or subcordate and mucronate apex, tapering at the base into the very short petiole, glaucous beneath, the lateral nerves few and rather conspicuous; stipules membranous, peltate, acute. Flowers axillary; males minute, in small clusters, subsessile; females solitary and longer, shortly stalked. Sepals 6, obovate, rounded at the apex, green margined with white. Stamens 3, filaments connate; anthers erect and with vertical slits. Styles 3, minute, free, 2-lobed. Capsule  $\frac{1}{8}$ - $\frac{1}{6}$  in. in diam., depressed-globose, 3-lobed, glabrous. Seeds  $\frac{1}{15}$  in., trigonous, rounded on the back, muriculate in fine lines, glabrous.

Dehra Dun (Edgeworth), Malwa, in black soil (Edgeworth). DISTRIB.: Drier parts of India from Bengal and C. India to S. India and Ceylon; also in Trop. Africa, Java, China and Australia.

**4. *P. urinaria*,** Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 660; F. B. I. v, 293; Watt E. D.; Prain Beng. Pl. 935; Cooke Fl. Bomb. ii, 587.

An annual or rarely perennial, glabrous or nearly so. Stems erect; branches few, often tinged with red; branchlets flattened and slightly winged, minutely hispid at the angles. Leaves sessile, distichously imbricate,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, oblong or linear-oblong, tip rounded or apiculate, pale beneath, glabrous or the margins minutely hispid; base rounded, usually oblique; stipules peltate, acute from a broad base. Flowers minute, solitary, subsessile. Sepals green, ciliolate, those of the males suborbicular; of the females oblong, not enlarged in fruit. Filaments very shortly connate; anthers erect, the slits vertical. Capsule  $\frac{1}{8}$  in. in diam., globose, obscurely lobed, echinate. Seeds trigonous, rounded on the back, transversely furrowed.

**5. *P. simplex*,** Retz. Obs. Bot. fasc. v, 29; Roxb. Fl. Ind. iii, 654; F. B. I. v, 295; Watt E. D.; Collett. Fl. Siml. 450; Prain Beng. Pl. 936; Cooke Fl. Bomb. ii, 587.

A glabrous perennial herb or an undershrub, very variable, usually with a long tap-root; branches flattened. Leaves many, distichous

and often imbricate, subsessile,  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, linear-oblong, obtuse and apiculate; stipules peltate, sagittate, brownish, scarious. *Flowers* usually solitary, on slender or stout pedicels, the females larger than the males. *Sepals* about  $\frac{1}{10}$  in. long, oblong, obtuse, those of the female flowers slightly enlarged in fruit. *Stamens* 3, filaments free; anthers didymous, the slits very short so that when the cells are confluent the dehiscence appears to be transverse. *Styles* short, once 2-fid., free or connate. *Capsule* globose,  $\frac{1}{10}$  in. in diam. obscurely 3-lobed, crustaceous, rough but not echinate. *Seeds* minute, trigonous, rounded on the back, finely tubercled, dark-brown.

Dehra Dun (Gamble), Pilibhit, N. Oudh in the districts of Kheri and Bahraich (Duthie). *DISTRIB.*: Throughout the hotter parts of India and up to 2,000 ft. in Kumaon; also in Ceylon, Malay Islands, China and in the Pacific Islands.

6. *P. Niruri*, Linn. *Sp. Pl.* 941; *Roxb. Fl. Ind.* iii, 659; *F. B. I.* v, 298; *Watt E. D.*; *Comm. Prod. Ind.* 887; *Prain Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 587.—*Vern. Jar-ámla, jangli-ámla.*

A glabrous annual, up to 2 ft. high. *Stems* often branching from the base, angular; branchlets slender, spreading. *Leaves* many, subsessile, distichous and often overlapping,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, elliptic-oblong, obtuse or rarely subacute, glaucous beneath, nerves obscure; stipules lanceolate-subulate, acute. *Flowers* axillary, numerous, very minute, the males solitary or 2-3-nate, the females solitary, on short pedicels. *Sepals* of male flowers  $\frac{1}{10}$  in. long, rounded; those of the female twice as long, oblong, subacute, white-margined, not enlarging in fruit. *Stamens* 3; anthers didymous, on a short column. *Styles* minute, free, 2-lobed. *Disk* of males of minute glands; of females annular, lobed. *Capsule* depressed-globose,  $\frac{1}{10}$  in. in diam., smooth, obscurely lobed. *Seeds* trigonous, rounded on the back and with parallel regular longitudinal ribs.

A common garden weed and in cultivated fields within the area; Dehra Dun (Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell), etc. Flowers in July and August. *DISTRIB.*: Throughout the hotter parts of India, also in Ceylon and in most tropical countries, but not in Australia. The plant is much used as a diuretic by the natives of India.

P. *DISTICHIUS*, Muell.-Arg.; *F. B. I.* v, 304; *Watt E. D.*; *Prain Beng. Pl.* 936; *Gamble Man.* 600; *Brandis Ind. Trees* 570; *Cooke Fl. Bomb.* ii, 589. *P. longifolius*, *Roxb. Fl. Ind.* iii, 672. *Cicca disticha*, *Linn.*,

*Royle Ill. 327.*—A small glabrous deciduous tree with pinnately distichous leaves and small reddish flowers in dense clusters. The acid fruit, about as large as a big gooseberry, is much used in tarts or as a pickle. The tree is a native of the Malay Islands and in Madagascar. It is met with in gardens within the area of this flora and in other parts of India.

**9. PUTRANJIVA, Wall.; Fl. Brit. v, 336.**

Trees. *Leaves* alternate, evergreen, entire or serrulate, pinnerved and reticulate. *Flowers* monococious or dioecious, axillary pedicelled; the males clustered, the females subsolitary. *Petals* and *disk* none. **MALE**-flowers: *Calyx* unequally 3-6-lobed, imbricate. *Stamens* 2-4, in the centre of the flower, filaments free or partially connate; anthers erect, cells parallel. *Pistillode* none. **FEM.**-flowers: *Calyx* as in male. *Ovary* ovoid, 2-3-celled; styles short, spreading, dilated into broad fleshy arms, ovules 2 in each cell. *Fruit* an ovoid or globose drupe; endocarp hard, 1-celled. *Seed* solitary, ovoid, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 2, India and Ceylon.

**P. Roxburghii**, Wall. *Tent. Fl. Nep.* 61; *Royle Ill. 347*, t. 83 bis; *Brandis For. Fl.* 451, t. 53; *Ind. Trees* 566; *F. B. I.* v, 336; *Watt E. D.*; *Collett Fl. Siml.* 452; *Kanjilal For. Fl.* (ed. 2), 349; *Gamble Man.* 604; *Frain Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 590. *Nageia Putranjiva*, *Roxb. Fl. Ind.* iii, 766.—*Vern. Jiaputa, putjia* (Hind.), *patji* (Oudh), *juti* (Kumaon bhábar), *putranjiva* (Sansc.).

A moderate-sized evergreen tree, almost glabrous except the young shoots; bark-grey, whitish when young. *Branches* drooping. *Leaves* alternate, coriaceous, dark-green, shining, 2½-4 in. long, obliquely elliptic-oblong or ovate, obtuse, acute or shortly acuminate, entire or distantly serrulate; main lateral nerves many, with reticulate venation between; petioles ½ in. long, pubescent; stipules small, triangular, acute, deciduous. *Flowers* small, yellow, dioecious. **MALES** very shortly pedicelled, arranged in dense axillary often spike-like clusters. *Sepals* 3-5, oblong, obtuse, ciliolate. *Stamens* usually 3, filaments more or less connate at the base, anthers globose. **FEM.**-flowers 2-3; pedicels ¾-1 in. long, pubescent. *Sepals* 5-6, broadly elliptic, obtuse, concave, ciliolate. *Ovary* 3-celled, tomentose:

styles 3, short, recurved, stigmas crescent-shaped. *Drupe*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovoid-globose, rounded or pointed at the apex, white-tomentose. *Putamen* pointed, very hard, deeply wrinkled, 1-seeded.

Moist shady forests in the Dehra Dun and Saharanpur forest divisions and eastwards along the Sub-Himalayan tracts. Flowers April and May, and the fruit ripens during the cold season. DISTRIB. : Throughout Tropical India, also in Ceylon and Burma. The whitish strong and durable wood is used by turners. Rosaries are made of the hard stones of the fruit to place round the necks of Hindu children to keep them in good health. The leaves are lopped for fodder and the seeds yield an oil which is used for burning.

**10. CYCLOSTEMON,** Blume; Fl. Brit. Ind. v, 339.

Trees. Leaves alternate, coriaceous, entire or crenulate, base often unequal. Flowers dioecious, in axillary clusters. Petals none. MALE-flowers: Sepals 4-6. Stamens many or few, inserted round a globose or depressed disk; filaments short, free; anthers erect, the cells parallel. Pistilode none or minute. FEM.-flowers: Calyx as in male. Disk annular or none. Ovary 2-4-celled, style elongate or none; stigmas dilated, fleshy or connate in a peltate disk, ovules 2 in each cell. Fruit subglobose or ovoid, indehiscent; pericarp hard, 2-celled. Seeds solitary in each cell, albumen fleshy, cotyledons broad and flat.—Species about 18, in Trop. India, Malaya and Africa.

**C. assamicus,** Hk. f. in F. B. I. v, 342; Kanjilal For. Fl. (ed. 2), 350; Gamble Man. 607; Prain Beng. Pl. 937; Eranthis Ind. Trees 567.

A small evergreen tree with very thin greenish-grey bark. Leaves 3-5 in. long, ovate or elliptic-oblong, obtuse or subacute at the apex, dark-green, glabrous, shining; base rounded or acute, usually oblique; margins undulate; main lateral nerves 8-10 pairs, slender; petioles up to  $\frac{1}{2}$  in. long; stipules none. Flowers globose, green. MALE-flowers in clusters. Stamens about 12. FEM.-flowers solitary. Ovary 2-celled, densely silky; stigmas 2, subsessile, fleshy. Fruit shortly pedicelled,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovoid or elliptic-oblong, rusty-tomentose. Seeds solitary in each cell; testa coriaceous, red.

Forests of Dehra Dun 'n swamps (Kanjilal) and eastwards along the Sub-Himalayan tract. Flowers Nov.-Dec. DISTRIB. : Kumaon up to

2,500 ft. and eastwards to the Darjeeling Terai, Assam, Khasia Hills, and from Chota Nagpur to Eastern Bengal and the Circars. The wood is hard and tough and with an even grain.

11. **ANTIDESMA**, Linn. ; Fl. Brit. Ind. v, 354.

Trees or shrubs. Leaves alternate, entire, stipules narrow, Flowers diœcious, apetalous, small or minute, in slender axillary or in terminal simple or branched spikes or racemes. MALE-flowers : *Calyx* 3-5, rarely 6-8-lobed or partite. *Disk* entire or lobed. *Stamens* 2-5, rarely more, inserted on or around the disk, often irregularly ; filaments inflexed in bud, anthers lunate or didymous ; cells globose, approximate or distant, connective thickened. *Pistilode* minute or obsolete. FEM.-flowers : *Calyx* as in male. *Disk* usually annular or cushion-like. *Ovary* usually 1-celled ; stigmas 2-4, usually short, 2-fid. or 2-partite ; ovules 2, pendulous. *Fruit* a small more or less compressed drupe, crowned by the sublateral or terminal stigmas. *Seed* small, albumen fleshy ; cotyledons broad, flat.—Species about 70, in the tropical regions of the Old World.

Leaves very obtuse ; flowers sessile ; stamens 4-7 ; ovary hairy . . . . . 1. *A. Ghæsembilla*.  
 Leaves acute or acuminate ; flowers pedicelled ; stamens usually 2 ; ovary glabrous . . . . . 2. *A. diandrum*.

1. **A. Ghæsembilla**, Gærtn. *Fruct.* i, 189, t. 39 ; *Brandis For. Fl.* 446 ; *Ind. Trees* 564 ; *F. B. I. v.*, 357 ; *Watt E. D.* ; *Gamble Man.* 610 ; *Prain Beng. Pl.* 938 ; *Cooke Fl. Bomb. ii*, 592. *A. paniculatum*, Roxb. *Fl. Ind. iii*, 770. *A. pubescens*, Roxb. *l. c.*

A small deciduous tree with greyish bark ; branchlets pubescent or fulvous-tomentose. Leaves 2-4 in. long, oval obovate or orbicular-oblong, rounded or emarginate at the apex, glabrous or nearly so on the upper surface, pubescent or tomentose beneath ; base rounded or subcordate ; main lateral nerves 5-6 pairs ; petioles  $\frac{1}{2}$ -1 in. long ; stipules about as long as the petioles, lanceolate, acute, downy. Flowers greenish-yellow, sessile, arranged in slender panicled spikes. MALE-flowers : *Calyx* 5-7-partite, densely fulvous-hairy. *Stamens* 4-7 ; anthers crescent-shaped. *Disk* 5-part., pubescent. FEM.-flowers : *Calyx* as in the male. *Disk* annular. *Ovary* densely

hairy; stigmas minute, recurved. *Drupe* subglobose when fresh,  $\frac{1}{2}$  in. in diam., reddish or black when ripe.

Common in the Sub-Himalayan forests of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June. DISTRIB.: Outer Himalayan ranges at low elevations, from the Sutlej to Bhutan; also in Assam Bengal, and from C. W. and S. India to Ceylon; extending to Burma, the Andamans, the Malay Pen. and Islands, China and Australia. The acid fruit is eaten, as well as the leaves. The Simla locality mentioned in Fl. Brit. Ind. refers to *Glochidion velutinum*.

2. *A. diandrum*, Roth Nov. Pl. Sp. 369; Brandis For. Fl. 447; Ind. Trees 565; F. B. I. v, 361; Watt E. D.; Kanjilal For. Fl. (ed. 2), 352; Gamble Man. 610; Fruin Beng. Pl. 938; Cooke Fl. Bomb. ii, 593. *Stilago diandra*, Roxb. Fl. Ind. iii, 759.—Vern. *Kali-khatai* (Dehra Dun), *dhakki* (Oudh), *amli* (Hind.).

A small deciduous tree or bush, the young parts usually glabrous; outer bark smooth, grey. Leaves bright-green, turning red before falling, thin, shortly petioled, varying in size from 1 to 5 in. in length, lanceolate or ovate-lanceolate, acute or acuminate, glabrous above, rarely pubescent beneath; stipules linear, acute, about twice as long as the petioles. Flowers minute, all pedicelled, in long slender glabrous or pubescent racemes; bracts ovate, shorter than the pedicels. MALE flowers: Calyx  $\frac{1}{20}$  in. long; lobes 4, short, obtuse. Stamens 2, rarely 3, at the base of the glabrous lobed disk. FEM.-flowers: Pedicels 3, at the base of the glabrous lobed disk. Calyx  $\frac{1}{10}$  in. long; lobes deeper than in the male. Ovary glabrous. Drupe  $\frac{1}{4}$  in. in diam., purplish-red when ripe.

Common in the *säl* forests of Dehra Dun and Saharanpur, and eastward along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June, and the fruit ripens in the cold season. DISTRIB.: Outer ranges of Himalaya from Garhwal and Kumaon eastwards; also in Bengal and in Central, W. and S. India, extending to Ceylon and Burma. The pinkish-grey wood is hard and close-grained. The leaves and small reddish fruits have a pleasantly acid taste, and are much eaten either raw or pickled.

#### 12. CROTON, Linn., Fl. Brit. Ind. v, 385.

Trees or shrubs, rarely herbs. Leaves alternate, rarely opposite or whorled, usually with 2 glands at the base. Flowers usually

monœcious, solitary or clustered on the rhachis of a terminal raceme ; bracts small. MALE-flowers : *Calyx* 5 (rarely 4 or 6)-partite, segments imbricate or subvalvate. *Petals* 5, rarely 4 or 6, never larger and sometimes smaller than the calyx. *Disk* of 4 or 6 glands, opposite the sepals. *Stamens* many, inserted on the hairy receptacle ; filaments free, inflexed in bud ; anthers adnate, the cells parallel. *Pistillode* none. FEM.-flowers : *Sepals* rarely accrescent in fruit. *Petals* smaller than the sepals. *Disk* as in the males. *Ovary* 3 (rarely 2 or 4)-celled ; ovules solitary in each cell ; style usually slender, 2-4-cleft. *Capsule* subequally 6-valved or of 3 separating 2-valved cocci. *Seeds* smooth, caruncle small, testa crustaceous, albumen copious, cotyledons broad.—Species upwards of 500, in all hot countries.

**C. oblongifolius**, Roxb. *Hort. Beng.* 69 ; *Fl. Ind.* iii, 685 ; *Brandis For. Fl.* 440 ; *Ind. Trees* 577 ; *F. B. I.* v, 386 ; *Watt E. D.* ; *Gamble Man.* 614 ; *Praim Beng. Pl.* 943 ; *Cooke Fl. Bomb.* ii, 599.—*Vern. Arjunna* (Oudh).

A medium-sized deciduous tree ; young parts inflorescence and ovary clothed with minute orbicular silvery scales. Leaves crowded towards the ends of the branchlets, 5-10 in. long, oblong-lanceolate, subacute, glabrous (when mature), crenate or serrate, pinninerved ; base usually acute, without apparent glands above the petioles ; petioles  $\frac{3}{4}$ - $1\frac{1}{2}$  in. long. *Flowers* yellowish-green, solitary or clustered in the axils of minute bracts on long erect often fascicled racemes. MALE-flowers many, on the upper portion of the raceme. *Calyx* divided about  $\frac{1}{2}$  towards the base ; segments  $\frac{1}{10}$  in. long or more, ovate, obtuse. *Petals*  $\frac{1}{8}$  in. long, elliptic-lanceolate, obtuse, woolly. *Stamens* 12, inflexed in bud ; filaments hairy below. FEM.-flowers at the base of the racemes ; pedicels short, stout. *Sepals* acute, the margins ciliate. *Petals*  $\frac{1}{12}$  in. long, obovate, the margins densely woolly. *Styles* 3, nearly  $\frac{1}{8}$  in. long, each divided into 2 slender curled branches  $\frac{1}{8}$  in. long. *Capsules*  $\frac{1}{8}$  in. in diam., subglobose, slightly 3-lobed, clothed with minute orbicular scales. *Seeds* ellipsoid, rounded on the back.

Common and often gregarious in the Gonda district of N. Oudh and in the Gorakhpur district (Brandis). The leaves turn red before falling in March, and the new foliage appears soon afterwards. DISTRIBUT. : Bengal, Ch. Nagpur, Silhet, Central, W. and S. India and in the dry region of Ceylon ; also in the mixed forests of Burma. The bark, leaves and fruit are used in native medicine.

*C. TIGLIUM*, Linn.; *Roxb. Fl. Ind.* iii, 682; *Brandis For. Fl.* 440; *F. B. I. v*, 393; *Watt E. D.*; *Gamble Man.* 614; *Prain Beng. Pl.* 943; *Cooke Fl. Bomb.* ii, 600.—*Vern Jaipál* (The Purging Crotalaria).

A small evergreen tree, with the young shoots stellately hairy. *Leaves* glabrous and membranous, 2-4 in. long, ovate, acuminate serrate, 3-5-nerved. *Stamens* 15-20. *Capsule*  $\frac{3}{4}$ -1 in. long, ovoid, 3-gonous. The plant is not truly indigenous in India, but it is frequently found as if wild, and in some parts of India is becoming naturalized. It is often cultivated in native gardens for the sake of the powerfully purgative oil yielded by the seeds. The so-called garden "Crotos," with variegated leaves, and which are much cultivated in Indian gardens, belong to the genus *Codicæum*.

**13. CHROZOPHORA**, Neck.; *Fl. Brit. Ind.* v, 408.

Diffuse densely hispid or stellately tomentose herbs or undershrubs. *Leaves* alternate, sinuate-toothed or lobed, wavy or plaited, 2-glandular at the base. *Flowers* monococious, in sessile axillary bracteate racemes; males crowded in the upper part of the raceme; females solitary and pedicelled. *MALE fl.* *Calyx* globose or ovoid, splitting into 5 valvate segments. *Petals* 5, short. *Disk* obscure. *Stamens* 5-15, filaments connate below in 1-3 series, anthers oblong; cells parallel, contiguous. *Pistillode* none. *FEM. fl.* *Sepals* 5, very narrow, sometimes setaceous or obsolete. *Disk* of 5 short broad glands alternate with the petals. *Ovary* 3-celled; styles 2-fid., erect or spreading, ovules solitary in each cell. *Fruit* a capsule of 3 hispid tomentose or scaly almost fleshy 2-valved cocci. *Seeds* without a strophiole, testa shining, albumen fleshy; cotyledons broad, flat.—Species about 7, Asiatic, Mediterranean and African.

Ovary and capsule clothed with stellate tomentum and silvery scales; stamens 5 . . . . . 1. *C. obliqua*, VAR. *hierosolymitana*.

Ovary and capsule clothed with stellate tomentum, but without silvery scales; stamens 15, in 2 series:—

An erect stellately hairy herb sparingly branched below; leaves up to 4 in. long, pale-green; sepals of female flowers triangular . . . . . 3. *C. Rottleri*.

Prostrate woolly herbs diffusely branching from the root; leaves up to  $1\frac{1}{2}$  in. in diam., often dark purplish-brown; sepals of female flowers linear:—

Leaves about as broad as long, eglandular at the base

3. *C. prostata*.

Leaves longer than broad, 2-glandular at the base

*C. prostrata*, VAR.  
*parvifolia*.

1. *C. obliqua*, A. Juss. Tent. *Euphorb.* 28, VAR. *hierosolymitana*, Spreng. *Syst.* 850. *C. verbascifolia*, A. Juss. *Croton tinctorius*, Wall. *Cat* 7716 G. Leaves ovate, nearly as long as broad, usually more or less toothed, clothed on both sides with stellate tomentum. Stamens 5. Ovary and capsule clothed with stellate hairs and silvery scales. Seeds glabrous.

The only locality recorded for this plant as occurring within the area of this flora is Muttra, where specimens are said to have gathered many years ago by Colonel Hardwicke, but by no other collector east of the Jumna subsequently. The plant appears to be widely distributed in the Punjab Plain from Ambala to Rawal Pindi and on the Salt Range; it extends also to Arabia, Palestine (Garden of Gethsemane near Jerusalem, collected by Sieber) and North Africa.

2. *C. Rottleri*, A. Juss. Tent. *Euphorb.* 28. *C. plicata*, Dalz. and Gibbs. (not of A. Juss.); Royle *Ill.* 329; *F. B. I. v*, 409; Watt *E. D.*; Prain *Beng.* i, l. 944; Cooke *Fl. Bomb.* ii, 607. *Croton plicatus*, Vahl; Roxb. *Fl. Ind.* iii, 681.

An erect hoary annual herb up to 2 ft. high, with a long straight slender tap-root. Stem usually naked below, sparingly branched above. Leaves 2-4 in. long, ovate to orbicular, often obscurely 3-lobed, thick, rugose, pale-green, stellate-hairy on both surfaces; petioles 1-2 in. long. Male flowers. Calyx  $\frac{1}{8}$  in. long. Petals smaller, very thin, ovate-lanceolate. Stamens 15, in two whorls. Fem. flowers. Sepals  $\frac{1}{8}$  in. long, triangular. Petals shorter and narrower. Capsules  $\frac{1}{8}$  in. in diam., densely stellate-hairy, but without silvery scales.

Mirzapur at Sháhganj (J.D.H.). DISTRIB. : Punjab Plain (T. Thomson); Sind (Stocks); Gujárát (D. and G.); Dharwar (Cooke). Deccan (D. and G., Graham, Cooke); Behar (J. D. H.) Bengal (Prain); Chota Nagpur (Haines); Burma (Griff); also in Madras Pres., extending to N. Africa and Spain. The root and leaves are stated by Stewart to be used medicinally in the Punjab.

**3. C. prostrata**, Dalz. in Dalz. and Gibs. *Bomb. Fl.* 233; Cooke *Fl. Bomb. ii*, 607. *C. plicata*, forma prostrata, Hook f. in *F. B. I. v*, 410.

A procumbent humifuse stellately woolly herb; branches many, spreading from the root, woolly-tomentose. *Leaves*  $\frac{1}{2}$ -1 in. long and about as broad, deeply bullate, often dark purplish-brown, finely pubescent above, densely stellate-woolly beneath, base eglandular. *Flowers* in short few-flowered axillary racemes; bracts linear,  $\frac{1}{2}$ - $\frac{1}{4}$  in. long. Male flowers. *Calyx*  $\frac{1}{2}$  in. long. *Petals* smaller, elliptic-lanceolate. *Stamens* 15, in two whorls. Fem. flowers. *Sepals* linear, acute. *Petals* linear, smaller and narrower than the sepals. *Capsule*  $\frac{1}{2}$  in. in diam., stellately woolly, without silvery scales.

Gorakhpur district (Dulthie); Naorangah (Jacquemont). **DISTRIB.**: Bengal, in Behar, Patna (Buch.-Hamilton)-Wall. Cat. 7716 C. partly; Punjab Plain, Lahore (T. Thomson), Multan (Edgeworth 8028), Jabalpur (Vicary); C. India, Guna (King); C. Prov., Nimar district near Hewra (Duthie); without locality (R. Thompson); also in the Bombay and Madras Presidencies, and extending to N. Africa.

**VAR. parvifolia**. *C. parvifolia*, Klotzsch ex Schweinf. *Pl. Nilot.* 10. Leaves longer than broad, 2-glandular at the base. Bundelkhand, in black soil (Edgeworth 8029); N. Oudh in the Kheri district (Duthie); Lucknow (T. Anderson); Mirzapur (Griffith), Farakhabad and Fatehpur (Griffith 4794). **DISTRIB.**: Punjab Plain: (Edgeworth 126), (T. Thomson 1508), (Drummond 3061, 6348), Sind (Stocks 547); extending south to Bombay and Madras Presidencies, also in N. Africa.

#### 14. BALIOSPERMUM. Blume; *Fl. Brit. Ind.* v, 461.

Erect shrubs. *Leaves* alternate, sinuate-toothed or lobed, penninerved or 3-5-nerved at the 2-glandular base. *Flowers* small, monococious or dioecious, apetalous, arranged in panicles or racemes. **MALE fl.** globose. *Sepals* 4-6, membranous, orbicular, concave, imbricate. *Disk* of 4-6 glands. *Stamens* 10-30; filaments slender, free; anthers terminal, the cells adnate throughout to the broad connective, dehiscing introrsely, the slits at length becoming lateral. *Pistillode* none. **FEM. fl.** *Sepals* 5-6, lanceolate, entire or toothed, sometimes accrescent in fruit. *Disk* entire. *Ovary* 3-celled; styles rather long, stout, 2-fid. or partite, stigmas smooth, ovules solitary in each cell. *Fruit* a capsule of three 2-valved crustaceous

cocci. Seeds ovoid, testa crustaceous, albumen fleshy, cotyledons flat and broad.—Species 6, in India and Malaya.

**B. axillare**. Blume *Bijdr.* 604; *F. B. I.* v, 461; *Kanjilal For. Fl.* (ed. 2), 357; *Gamble Man.* 624; *Prain Beng. Pl.* 946; *Brandis Ind. Trees* 583; *Cooke Fl. Bomb.* ii, 608. *B. indicum*, *Dcne. in Jacqm. Voy. Bot.* 154, t. 155. *B. montanum*, *Muell. Arg.*, *Watt E. D.*; *Croton polyandrum*, *Roxb. Fl. Ind.* iii, 682; *Royle Ill.* 327, 328.

A stout leafy undershrub 3-6 ft. high with herbaceous branches from the root, glabrous except the young shoots and sometimes the leaves beneath. Leaves firmly coriaceous, very variable in size and shape; the upper 2-3 in. long, lanceolate, pinninerved; the lower 6-12 in. long, often palmately 3-5-lobed and with sinuate-toothed margins; base rounded or cuneate; petioles 2-6 in. long; stipules of 2 glands. Flowers usually monococious, arranged in many axillary racemes or contracted panicles, all male or with a few females at the base. MALE flowers: *Calyx* globose,  $\frac{1}{10}$  in., 4-5-partite, often slightly hairy; segments finely mottled. *Disk* of 6 glands. *Stamens* about 20. FEM. flowers. *Sepals* not enlarging in fruit. *Disk* thin,  $\frac{1}{10}$  in. in diam. *Ovary* hairy; styles about  $\frac{1}{8}$  in. long, thick, 2-partite, dull-red. *Capsules*  $\frac{1}{2}$  in. long, obovoid, usually hairy. *Seeds*  $\frac{1}{3}$  in. long, smooth, mottled.

Dehra Dun, in shady places, and eastwards along the Sub-Himalayan forest tracts, where it often forms a considerable portion of the undergrowth. It flowers and produces fruit almost throughout the year. DISTRIB.: Outer ranges of Himalaya from Kashmir to Bhutan up to 3,000 ft.; also Assam, Khasia Hills, Bengal, Chittagong, Burma and Siam, and from C. & W. India to Travancore; extending to Java and the Malay Peninsula. The seed, which resembles that of the Castor-oil plant, but smaller, is used as a drastic purgative, and the root and leaves are much employed in Hindu medicine.

#### 15. ACALYPHA, Linn.; *Fl. Brit. Ind.* v, 414.

Herbs, shrubs or trees. Leaves alternate, toothed or crenate, rarely entire, pinniveined or 3-5-nerved. Flowers small, monococious or occasionally dioecious, apetalous and without a disk, arranged in axillary or terminal racemes; males minute, without bracts; females 1-2, within a peduncled solitary bract, or sometimes at the base of large accrescent leafy bracts, low on the male spikes

or on separate spikes. MALE flowers: *Sepals* 4, valvate, more or less connate in a membranous calyx. *Stamens* usually 8, or many on a convex receptacle; filaments short, free; anther-cells distinct, divaricate, often becoming twisted or flexuous. *Pistillode* none. FEM. flowers: *Sepals* 3-4, minute, imbricate. *Ovary* 3-celled; styles filiform, often long and laciniate or fimbriate; ovules solitary in each cell. *Fruit* a capsule of 3 minute 2-valved crustaceous cocci. *Seeds* subglobose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 225, in trop. and sub-trop. regions of the world.

Bracts distant, shortly dentate; capsule hispid 1. *A. indica*.

Bracts crowded, fimbriate; capsule glabrous 2. *A. ciliata*.

1. *A. indica*, Linn. Sp. Pl. 1003; Roxb. Fl. Ind. iii, 675; Royle Ill. 327; F. B. I. v, 416; Watt E. D.; Prain Beng. Pl. 948; Cooke Fl. Bomb. ii, 610.

An erect annual herb, 1-2½ ft. high. *Branches* many, angular, finely pubescent. *Leaves* thin, glabrous, 1-3 in. long, ovate or rhomboid-ovate, obtuse or subacute, crenate-serrate; base cuneate, 3-nerved; petioles slender, usually longer than the blade; stipules minute. *Flowers* in lax erect axillary elongate spikes; the males minute, clustered towards the summit of the spike, ebracteate; the females in clusters of 3-5, subtended by a shortly stalked leaf-like truncate dentate many-nerved bract ½-1 in. in diam. *Capsules* hispid, concealed by the bracts, often only 1-seeded. *Seed*  $\frac{1}{30}$  in. long, ovoid, smooth, pale-brown.

Very common within the area, especially as a garden weed, flowering during the greater part of the year. DISTRIB.: Throughout the hotter parts of India and in Ceylon, extending to Java and Trop. Africa.

2. *A. ciliata*, Forsk. Fl. Egypt.-Arab. 162; Roxb. Fl. Ind. iii, 676; F. B. I. v, 417; Watt E. D.; Collett Fl. Siml. 452; Prain Beng. Pl. 948; Cooke Fl. Bomb. ii, 611.

A stout herb, 1-2½ ft. high. *Stems* erect; branches few, pubescent when young. *Leaves* thin, 1½-3 in. long, ovate, acuminate or caudate-acuminate, finely serrate, pubescent on the veins beneath; base usually rounded, 5-nerved; petioles spreading, slender, usually exceeding the leaf-blade. *Flowers* in axillary androgynous spikes ½-2 in. long; the males few, very minute and sessile at the top of the spike; the females many and crowded at its base; bracts large,

pale-green, 1-2-flowered, exceeding the capsules, strongly nerved, the many nerves ending in long subulate hispid teeth. *Capsules* glabrous; *cocci* very thin, white. *Seeds* globose-ovoid, smooth,  $\frac{1}{15}$  in. long.

Dehra Dun (Duthie), Bundelkhand (Edgeworth) and probably in many other localities within the area. *DISTRIB.*: W. Himalaya from Kashmir to Kumaon up to 6,000 ft., and southwards from Bengal and Bombay to S. India and Ceylon, extending to Arabia and Trop-Africa.

**16. TREWIA**, Linn.; *Fl. Brit. Ind.* v, 423.

Soft-wooded trees. *Leaves* opposite, broadly ovate or orbicular; entire; base cordate, 3-5-nerved. *Flowers* rather large, dioecious, appearing before the leaves, apetalous and without a disk; males in lax lateral racemes, one to each bract; females solitary on long peduncles or racemose. *MALE fl.*: *Calyx* globose, splitting into 3-4 broad concave often reflexed segments. *Stamens* many, on a convex receptacle, filaments free, anthers dorsifixated, oblong, the cells parallel and contiguous. *Pistillode* none. *FEM. fl.*: *Sepals* 3-5, broad, imbricate, caducous. *Ovary* 2-4-celled; styles connate below, long, terete, entire, papillose throughout, ovules solitary in each cell. *Fruit* 2-4-celled, indehiscent or opening loculicidally, endocarp crustaceous. *Seeds* ovoid, testa hard, albumen fleshy, cotyledons broad and flat.—Species 2, one in India extending to Ceylon, the other apparently endemic in W. and S. India.

**T. nudiflora**, Linn. *Sp. Pl.* 1193 (*Trevia*); *Roxb. Fl. Ind.* iii, 837; *Brandis For. Fl.* 443; *Ind. Trees* 590; *F. B. I.* v, 423; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2.), 353; *Gamble Man.* 617; *Prain Beng. Pl.* 948; *Cooke Fl. Bomb.* ii, 614.

A medium-sized deciduous tree with a smooth grey bark. Young shoots and the leaves beneath and the inflorescence clothed with cottony wool or sometimes nearly glabrous. *Leaves* 3-7 in. long, ovate, acuminate, glabrous and bright-green above; base rounded or cordate, 3-5-nerved; petioles 1-3 in. long; stipules minute, acute, caducous. *MALE flowers*  $\frac{1}{2}$ - $\frac{1}{3}$  in. in diam., pale-green, arranged in pendulous racemes 3-8 in. long; pedicels short, slender, horizontal. *Sepals* valvate, concave. *Stamens* many. *FEM. flowers* solitary or 2-3 together, on long peduncles. *Sepals* 3-5, imbricate, caducous.

*Ovary* woolly; styles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, yellow. *Fruit* almost woody, globose, 1- $1\frac{1}{2}$  in. in diam. *Seeds* smooth and polished, dark-brown.

Ravines and damp places in the forests of Dehra Dun and Saharanpur, extending eastwards along the Sub-Himalayan forest tracts of Rohilkhand, N. Oudh and Gorakhpur. The tree is leafless from Jan. to March, the new leaves appear during March and April, and the flowers between Feb. and April, and the fruit ripens during the cold season. *DISTRIB.*: Kumaon, Assam and the Khasia Hills, and southwards throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Pen. and Islands. Brandis states that this tree, reproduces abundantly from root-suckers. The soft white wood is used for making drums.

17. **MALLOTUS**, Lour. ; Fl. Brit. Ind. v, 427.

Trees or shrubs. *Leaves* opposite or alternate, entire toothed or 3-lobed, pinniveined or 3-7-nerved, sometimes peltate, often gland-dotted beneath and sometimes with glandular areas at the base on the lower surface. *Flowers* small, dicocious or monococious, apetalous, arranged in axillary or terminal simple or branched spikes or racemes; males fascicled, females solitary in the bracts. *MALE* flowers: *Calyx* globose or ovoid, 3-5-partite, lobes valvate. *Disk* none. *Stamens* many, crowded on the flat or convex receptacle, filaments free, anthers small, dorsifix; the cells globose or shortly oblong, parallel, adnate to the wide connective, often distinct. *Pistillode* none or very minute. *FEM.* flowers: *Calyx* spathaceous or 3-6-lobed or-partite. *Disk* none or small; styles free or connate below, spreading or recurved above, entire plumose or papillose, ovules solitary in each cell. *Fruit* a capsule of 2-3 (rarely 4) 2-valved tubercled echinate paleaceous or smooth cocci. *Seeds* ovoid oblong or globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 70-80, in tropical regions of the Old World.

**M. philippensis**, Muell. Arg. in *Linnæa* xxiv, 196; Brand. For. Fl. 444; Ind. Trees 590; F. B. I. v, 442; Watt E. D.; Comm. Prod. Ind. 755; Kanjilal For. Fl. (ed. 2) 353; Gamble Man, 619; Collett Fl. Siml. 453; Prain Beng. Pl. 950; Cooke Fl. Bomb. ii, 615. *Rottlera tinctoria*, Roxb.; Fl. Ind. iii, 827; Royle Ill. 329.—*Vern Kamela, raini* (Dehra Dun), *reoni* (Bundelkhand), *rohni* (Oudh), *senduria* (Merwara).

A small much-branched evergreen tree with a thin dark-grey bark ; young parts and inflorescence tawny or rusty-pubescent. *Leaves* alternate, variable in size and shape, 3-6 in. long, ovate ovate-oblong or lanceolate, acuminate, entire or sometimes toothed, glabrous above, sub-glaucously pubescent and with many close-set orbicular reddish glands beneath, reticulately veined, base rounded or acute, strongly 3-nerved and with 4-7 pairs of lateral nerves above the basal ones ; petiole about half the length of the blade, fulvous-pubescent and with two small sessile glands one on each side of the summit. *Flowers* small, dicocious. MALE flowers sessile or nearly so, in erect terminal spikes longer than the leaves. *Sepals* usually 4, lanceolate, acute. FEM. flowers sessile in short spikes. *Sepals* 3 or 4. *Capsules*  $\frac{1}{2}$ - $\frac{1}{3}$  in. in diam., 3-lobed and 3-valved, covered with a bright red powder composed of fine grains of a resinous substance mixed with minute stellate hairs. *Seeds* about  $\frac{1}{3}$  in. in diam., subglobose, black.

Very common within the area, and often associated with sal. Flowers during the cold season and the fruit ripens from March to May.   
DISTRIB. : Outer Himalayan ranges from the Indus eastwards, up to 4,500 ft. ; and throughout tropical India ; extending to Ceylon, Burma, the Andaman and Malay Islands, China and Australia. The red resinous grains with which the ripe capsules are covered is the well known *kamela* powder. It is much valued as a dye, especially for silk, and is also extensively used as a vermifuge. The bark is sometimes employed in tanning, and the wood affords good fuel.

#### 18. HOMONOIA, Lour. ; Fl. Brit. Ind. v. 455.

Rigid shrubs. *Leaves* alternate, long, narrow and subentire or short and toothed, glandular-lepidote. *Flowers* usually dicocious, apetalous and without any disk, arranged in many-or few-flowered axillary spikes, or from the old wood. MALE flowers : *Calyx* globose, splitting into 3 valvate segments. *Stamens* many, in a dense globose cluster of branched filaments ; anther-cells sub-globose, divaricate, connective obscure. *Pistillode* none. FEM. flowers : *Sepals* 5-8, narrow, unequal, imbricate, eaducous. *Ovary* 3-celled, styles entire, spreading, papillose, ovules solitary in each cell. *Fruit* a small capsule of 3 smooth 2-valved cocci, *Seeds* rounded on the back, slightly angular on the inner face ; testa crustaceous, hard with a thin fleshy coat, albumen fleshy, cotyledons broad and flat.—Species 3 or 4, Indian or Malayan.

**H. riparia**, Lour. *Fl. Cochinch.* 637; *Erandis For. Fl.* 445; *Ind. Trees* 593; *F. B. I. v.* 455; *Watt E. D.*; *Gamble Man.* 622; *Prain Beng. Pl.* 951; *Cooke Fl. Bomb. ii*, 620; *Adelia nerifolia*, *Roth*; *Roxb. Fl. Ind. iii*, 849.

A small evergreen willow-like shrub with brown bark; branchlets young leaves and inflorescence pubescent. Leaves erect, closely set, 3-6 in. long, linear-oblong or linear-lanceolate, acute, apiculate, entire or serrulate towards the tip, glabrous above, densely clothed beneath with reddish-brown orbicular gland-like scales; base acute or rounded; main lateral nerves 10-30 pairs, the veins between them reticulate; petioles  $\frac{1}{8}$ - $\frac{3}{8}$  in. long; stipules  $\frac{1}{4}$  in. long, linear-lanceolate, acute. Flowers diocious, sessile, in axillary bracteate spikes 2-5 in. long; rachis pubescent; bracts ovate-acuminate, pubescent. MALE flowers: Sepals 3, broadly elliptic, concave, glabrous,  $\frac{1}{8}$  in. long. Anthers red. FEM. flowers. Sepals usually 5, narrowly ovate, acuminate,  $\frac{1}{8}$  in. long, pubescent. Ovary pubescent; styles 3, shortly connate at the base. Capsule globose,  $\frac{1}{8}$  in. in diam., tomentose. Seeds  $\frac{1}{16}$  in. long, smooth, yellowish-brown.

Bundelkhand, in rocky river-beds (Edgeworth, Duthie, etc.). DISTRIB.: Bengal, Sikkim, Chittagong, Assam, Khasia Hills, Burma and southwards to Central and W. India to Ceylon; extending to the Andaman Islands, Cochinchina and Java.

19. **RICINUS**, Linn.; *Fl. Brit. Ind. v*, 457.

A tall glabrous and glaucous annual, sometimes shrubby or tree-like. Leaves alternate, broad, palmately lobed; lobes 7 or more, serrate. Flowers monoecious, rather large, in terminal sub-paniculate racemes. Perianth simple and without any disk, the male flowers crowded in the upper portion of the inflorescence, the females below. MALE flowers: Calyx membranous, splitting valvately into 3-5 segments. Stamens very many; filaments connate and repeatedly branched; anthers with distinct distant sub-globose divergent cells. Pistillode none. FEM. flowers: Calyx spathaceous, caducous. Ovary 3-celled; styles entire, 2-fid. or 2-partite; ovules solitary in each cell. Fruit a prickly capsule of three 2-valved cocci. Seeds oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat.—A single species, probably of African origin, now widely cultivated in tropical countries.

**R. communis.** Linn., Roxb. Fl. Ind. iii, 689; Royle Ill. 328; Brandis For. Fl. 445; Ind. Trees 593; DC. L'Orig. Pl. Cult. 339; Duthie and Fuller F. and G. Crops ii, 38, t. 43; F. B. I. v, 457; Watt E. D.; Comm. Prod. Ind., 915; Gamble Man. 622; Prain Beng. Pl. 952; Cooke Fl. Bomb. ii, 627.—Vern. Arand, etc.—The Castor-oil plant, or Palma Christi.

The Castor-oil plant is much cultivated within the area of this flora and throughout the hotter parts of India. It frequently runs wild, and in many places has become naturalized. The tall perennial bushy kind is often grown in hedges, or in fields as a shelter for other crops. In order to obtain oil of the best quality the plant is usually grown as an annual, and often as a pure crop. The oil is largely used for burning and as a lubricant, and (when cold-drawn) for medicinal purposes. The plant is much cultivated in gardens for the sake of the brightly coloured foliage of some of its varieties. For full particulars regarding its cultivation in India, and the extraction and the various uses of the oil see Watt's "Commercial Products of India."

**20. TRAGIA.** Linn.; Fl. Brit. Ind. v, 464.

Perennial usually twining or climbing herbs, hispid with stinging hairs. Leaves alternate, simple or palmately 3-lobed, serrate, 3-5-nerved at the base. Flowers monococious, in terminal and leaf-opposed androgynous racemes, apetalous and without any disk; the males uppermost in the raceme, females below and few. MALE flowers: Calyx globose or obovoid, valvately 3-5-partite. Stamens 1-3, rarely many, filaments free or connate; anthers ovate or oblong, cells parallel and contiguous. Pistillode minute, 3-fid. or none. FEM. flowers: Sepals 6, imbricate, entire or pinnatifid, often enlarged, hardened and stellately spreading in fruit. Ovary 3-celled; styles united below in a stout column, free spreading and entire above; ovules solitary in each cell. Fruit a capsule of three 2-valved cocci, endocarp crustaceous. Seeds globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 50, chiefly tropical.

A twining herb; leaves simple; style circinately revolute . . . . . 1. *T. involucrata*.

An erect or sometimes climbing herb; leaves palmately 3-partite; styles slightly spreading, not revolute . . . . . 2. *T. cannabina*.

1. *T. involucrata*, Linn. *Sp. Pl.* 980; *Roxb. Fl. Ind.* iii, 576; *Royle Ill.* 327; *F. B. I. v.*, 465; *Watt E. D.*; *Prain Beng. Pl.* 952; *Cooke Fl. Bomb. ii*, 621.

A perennial more or less hispid herb, with scattered stinging hairs. *Stems* elongate, slender, twining. *Leaves* 1-4 in. long, variable, oblong-lanceolate to broadly ovate, acuminate, serrate, hairy; base rounded or cordate; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; stipules  $\frac{1}{2}$  in. long, ovate, acute, somewhat auricled at the base. *Flowers* yellowish, shortly stalked, usually in hairy racemes 1-2 in. long; bracts  $\frac{1}{6}$  in. long, lanceolate, acute. *MALE flowers*: *Sepals* 3, broadly elliptic or orbicular, concave, glabrous,  $\frac{1}{16}$  in. long. *Stamens* 3. *Pistillode* minute, 3-fid. *FEM. flowers*: *Sepals* 6, ovate, pinnatifid, very hispid,  $\frac{1}{8}$  in. long, elongating in fruit. *Ovary* 3-lobed, hispid; styles 3, united below in a stout column which is often as long as the circinnately revolute branches. *Capsules*  $\frac{1}{8}$  in. in diam., 3-lobed, white, hispid. *Seeds* globose, smooth.

Forests of N. Oudh (R. Thompson), Kheri district (Duthie) *DISTRIB.*: Throughout India from the Punjab and the outer Himalayan ranges eastwards to Assam, and south to Burma, S. India and Ceylon; also in China. The plant is not eaten by cattle. The root, leaves and fruit are used medicinally.

2. *T. cannabina*, Linn. *f. Suppl.* 415; *Roxb. Fl. Ind.* iii, 575; *Cooke Fl. Bomb. ii*, 622. *T. involucrata*, var. *cannabina*, *Muell.-Arg.*; *F. B. I. v.*, 465.

An erect or climbing shrub 4-5 ft. high, not twining, more or less hispid and with stinging hairs. *Stems* stout, terete, woody. *Leaves* palmately 3-partite, up to  $3\frac{1}{2}$  in. long; lobes toothed or pinnatifid, the mid-lobe much longer than the lateral ones. *Male flowers* and *calyx* of *female flowers* as in *T. involucrata*. *Styles* 3, slightly spreading, not revolute. *Capsules*  $\frac{3}{8}$  in. across, 3-lobed, hirsute; lobes globose. *Seeds* globose, smooth,  $\frac{1}{8}$  in. in diam.

Jumna ravines near Etawah (Duthie), Bundelkhand (Duthie), and probably in other localities within the area of this flora. *DISTRIB.*: Throughout the hotter parts of India and in Ceylon; often found in hedges.

21. **SAPIUM**, P. Br.; *Fl. Brit. Ind.* v, 469.

Trees and shrubs. *Leaves* alternate, entire, serrate or toothed, pinninerved, petiole often 2-glandular at the top. *Flowers* monœcious, in terminal simple or branched spikes or racemes, apetalous and without any disk; males above, several in each bract;

females in the lower part of the spikes or racemes, or in separate spikes, solitary in the bracts. MALE flowers: *Calyx* membranous, shortly 2-3-lobed or toothed, or splitting to the base into 2 or 3 valvate segments. *Stamens* 2 or 3, filaments free; anther-cells ovoid, distinct, contiguous, parallel. *Pistillode* none. FEM. flowers: *Calyx* 3-fid. or 3-partite. *Ovary* 2-3-celled, styles free or connate at the base, spreading and recurved, entire; ovules solitary in each cell. *Fruit* a crustaceous capsule, fleshy or pulpy, rarely woody, at length loculicidally 3-valved. *Seeds* globose, with a strophiole, usually long-persistent on the columella, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 25, all tropical.

**S. insigne**, Trimen *Syst. Cat. Ceyl. Pl.* 83; *F. B. I. v.*, 471; Watt *E. D.*; Kanjilál *For. Fl.* (ed. 2) 356; Collett *Fl. Siml.* 453; Gamble *Man.* 625; Prain *Beng. Pl.* 954; Cooke *Fl. Bomb.* ii, 622; Brandis *Ind. Trees* 585. *Falconeria insignis*, Royle *Ill.* 354, t. 84 a or t. 98. *F. Wallichiana*, Royle *l.c.f.* 3. *Excaecaria insignis*, Muell. Arg.; *Brandis For. Fl.* 442.—Vern. *Khinna*, *khirun*, *khiria*, *khirni*, *lendwa*.

A medium-sized glabrous deciduous tree or shrub, with a thick acrid milky juice; bark grey, rough and cork-like when old; branches thick and soft. *Leaves* bright-green, crowded towards the ends of the branches, 5-10 in. long, elliptic or oblong-lanceolate, acuminate, crenate-serrate; base acute, sometimes unequal; main lateral nerves 10-16 pairs, slender; petioles 1-1½ in. long, with 2 conspicuous glands at the apex. *Flowers* appearing before the leaves, yellowish green, in 1-sexual robust spikes 3-8 in. long. MALE FLOWERS sessile,  $\frac{1}{4}$ - $\frac{1}{3}$  in. in diam., the central flower of each fascicle opening first. *Sepals* 2, open in bud, orbicular, concave,  $\frac{1}{16}$  in. in diam. *Stamens* 2, filaments very short, anthers scarlet. FEM. FLOWERS shortly stalked. *Sepals* ovate-acuminate. *Styles* 3, short spreading, slightly connate at the base. *Capsules*  $\frac{1}{2}$  in. in diam., subglobose, at first fleshy, becoming dry and irregularly dehiscent when ripe, closely packed on the robust rhachis.

Dehra Dun and Sub-Himalayan tract eastwards. Flowers Jan.—March. DISTRIB.: Outer warm valleys of the Himalaya on dry rocky slopes from the Beas eastwards to Bhutan (not in Sikkim) up to 5,500 ft.; also in Assam, Chittagong and Burma; extending to the Bombay Pres., S. India and Ceylon. The soft white wood is used for making the cylinders of native drums. The acrid milky juice, said to be

poisonous, is sometimes used externally in medicine. The tree is frequently killed by frost at the higher elevations.

*SAPIUM SEBIFERUM*, Roxb.; *Fl. Ind.* iii, 693; *F. B. I. v.*, 470; Watt. *E. D.*; *Comm. Prod. Ind.* 979; *Kanjilál For. Fl.* (ed. 2), 355; *Gamble Man.* 624; *Prain Beng. Pl.* 954; *Brandis Ind. Trees* 584; *Cooke Fl. Bomb. ii.*, 623. *Excoecaria sebifera*, *Mudl.-Arg.*; *Brandis For. Fl.* 441. *Stillingia sebifera*, *Michx.*; *Royle Ill.* 328.—*Vern. Tár-charbi* (Dehra Dun), *pahári shisham* (Saharanpur). (Chinese Tallow-tree). A small quick-growing deciduous tree, somewhat resembling in its foliage the shisham-tree (*Dalbergia Sissoo*). It is cultivated in many parts of the Upper Gangetic Plain, and has become quite naturalized, especially in Dehra Dun. It flowers June—Aug., and the seeds ripen Oct.—Dec. The tree is indigenous in China and Japan, where the white tallow-looking wax surrounding the seeds is used for burning. The leaves before falling become beautifully coloured with orange and scarlet.

The following plants belonging to genera not mentioned above should be briefly noticed:—

*PEDILANTHUS TITHYMALOIDES*, Poit.—A shrub with fleshy branches, allied to *Euphorbia*, from which it chiefly differs in its conspicuous scarlet slipper-shaped involucre. It was introduced into India from the West Indies, and is grown in hedges in many parts of the country. Royle (Ill. 328) mentions it as a possible substitute for ipecacuanha (*Psychotria Ipecacuanha*), which is a native of Brazil.

*JATROPHA CURCAS*, Linn.; *Royle Ill.* 328; *Brandis For. Fl.* 442; *Ind. Trees* 576; *F. B. I. v.* 383; Watt *E. D.*; *Kanjilál For. Fl.* (ed. 2), 352; *Gamble Man.* 613; *Prain Beng. Pl.* 941; *Cooke Fl. Bomb. ii.*, 578.—*Vern. Safed arand.* (Physic-nut). A soft-wooded evergreen shrub or small tree introduced from Trop. America. It is often found in a semi-wild condition in the vicinity of villages or is planted in hedges. The oil extracted from the seeds is much used for burning, as well as medicinally. Other exotic species of *Jatropha*, including *J. gossypifolia*, *multifida* and *poda-grica*, are more or less cultivated in Indian gardens for ornamental purposes.

*ALEURITES MOLUCCANA*, Willd.; *Royle Ill.* 327; *F. B. I. v.* 384; Watt. *E. D.*; *Gamble Man.* 613; *Prain Beng. Pl.* 942; *Cooke Fl. Bomb. ii.*, 626. *A. triloba*, *Forst.*; *Roxb. Fl. Ind.* iii, 629. *Bel-gaum Walnut.*

A handsome tree with polymorphous leaves and white flowers. It is a native of the Malay Archipelago, whence it was introduced into India and is now largely grown in gardens. The edible seeds contain a large quantity of oil, which is used for cooking as well as medicinally.

MANIHOT UTILISSIMA, *Pohl.* is the Bitter Cassava plant, from the pounded roots of which mandioc or cassava meal is prepared, also tapioca. It is a tall plant with tuberous roots and palmate leaves. It was introduced from S. America by the Portuguese and is occasionally cultivated in Indian gardens.

### C. URTICACEÆ.

Herbs shrubs or trees. *Leaves* usually alternate, often oblique ; stipules various. *Flowers* cymose or in clusters, usually minute, monoecious or dioecious and sometimes 2-sexual or polygamous, often crowded on the surface of a fleshy flat concave or globose receptacle or (in *Ficus*) on the inner walls of a closed receptacle ; bracts usually small or none, but sometimes 2—4 or more in an involure ; bracteoles small or none, but sometimes conspicuous. *Perianth* simple, calycine, regular or irregular, equally or unequally toothed lobed or partite, segments imbricate or valvate. *Disk* hypogynous, obscure or none. *Stamens* as many as and opposite the perianth-lobes, rarely fewer or more, filaments usually free at the base, anthers 2-celled. *Pistillode* in male flowers small or none. *Ovary* superior, 1-celled, style often eccentric, simple or 2-fid, with stigmatose arms, or stigmas sessile, plumose or penicillate, ovule solitary. *Fruit* simple, as a drupe or samara, or of small free achenes, or compound in a confluent mass of perianths and pericarps. *Seed* erect, lateral or pendulous, testa membranous ; albumen copious scanty or none, embryo straight or curved.—Species 1,500 or more, chiefly in tropical and sub-tropical regions of the world.

Plants with watery juice :—

Anthers in bud erect ; style 2-fid. ; ovule pendulous :—

Flowers usually 2-sexual or polygamous—

Trees or shrubs with pinninerved deciduous leaves :—

Fruit dry, samaroid

I. HOLOPTELEA.

Fruit a drupe.—Trees or shrubs :—

Leaves glabrous or softly pubescent ;  
male-sepals imbricate ; cotyledons  
broad . . . . .

Leaves scarious ; male-sepals induplicate-valvate ; cotyledons narrow . . . . .

Flowers usually dioecious.—Herbs with  
digitate leaves . . . . .

Anthers in bud inflexed ; style undivided  
or none ; ovule erect :—

Leaves and stem with stinging hairs.—

Herbs with alternate leaves and connate  
stipules . . . . .

Leaves and stems without stinging hairs :—

Female perianth 3-5-partite or obsolete ;  
stigma penicillate ; flowers in cymes  
or clustered on a fleshy receptacle :—

Leaves opposite ; flowers minute, in  
dense cymose heads . . . . .

Leaves alternate ; flowers on a fleshy  
receptacle ; female perianth minute  
or obsolete . . . . .

Female perianth tubular, shortly toothed  
or subentire, enclosing the achene :—

Fruiting perianth dry, membranous ;  
stigma filiform :—

Stigma persistent—Shrubs or small  
trees . . . . .

Stigma jointed to apex of ovary,  
deciduous—Herbs or under  
shrubs . . . . .

Fruiting perianth more or less  
fleshy :—

Stigma sessile, subpeltate,  
ciliate . . . . .

Stigma penicillate . . . . .

Female perianth none ; flowers minute,  
in small cymose globose heads ;  
stigma penicillate.—A shrub with  
the leaves snowy-white beneath. . . . .

2. CELTIS.

3. TREMA

4. CANNABIS.

5. GIRARDINIA.

6. PILEA.

7. ELATOSTEMA.

8. BOEHMERIA.

9. POUZOLZIA.

10. VILLEBRUNEA

11. DEBREGEASIA.

12. MAOUTIA.

Plants with milky juice :—

Anthers in bud reversed ; stamens inflexed ; ovules pendulous, anatropous.—Shrubs or trees :—

Female sepals fleshy and confluent in fruit, enclosing the achenes ; styles 2-fid. ; flowers many, in spikes, or the fem. flowers subcapitulate . . . . .

13. MORUS.

Female sepals not fleshy in fruit—A small tree or shrub with very rough leaves . . . . .

14. STREBLUS.

Anthers in bud erect :—

Flowers all exposed ; inflorescence congested in globose or oblong heads :—

Flowers dioecious, in small globose heads ; stamens 4.—A subscandent spinescent shrub . . . . .

15. CUDRANIA.

Flowers monœcious, in large oblong heads ; stamen 1.—Erect evergreen unarmed trees . . . . .

16. ARTOCARPUS.

Flowers attached to the inner walls of a closed receptacle, monœcious rarely dicecious.—Trees or erect or climbing shrubs, often epiphytic . . . . .

17. FICUS.

**1. HOLOPTELEA, Planch. ; Fl. Brit. Ind. v, 481.**

A large deciduous tree. *Leaves* alternate, distichous, pinnerved, entire ; stipules lateral, scarious. *Flowers* polygamous or 2-sexual, the males without a rudimentary ovary, arranged in fascicles at the scars of the previous year's shoots which are scaly but leafless. *Perianth* simple, calycine, 4-8-partite ; lobes imbricate, often unequal. *Stamens* 4-8, usually 6-8 ; filaments erect, at length exserted, anthers hairy. *Ovary* stipitate, compressed ; style short, 2-fid., the arms stigmatose within throughout their length ; ovule solitary, pendulous. *Fruit* dry, indehiscent, samaroid or flat, the nucleus expanded into an obliquely ovate reticulate wing. *Seed* flat, albumen none, cotyledons longitudinally complicate ; radicle small, superior — A single species, confined to India, Ceylon and Cochin China.

**H. integrifolia**, Planch. in *Ann. Sc. Nat. Ser. 3*, 259; *F. B. I. V.*, 481; Watt *E. D.*; Kanjilal *For. Fl.* (ed. 2) 360; Gamble *Man.* 628; Prain *Beng. Pl.* 958; Cooke *Fl. Bomb.* ii, 629; Brandis *Ind. Trees* 595. *Ulmus integrifolia*, Willd.; Roxb. *Fl. Ind.* ii, 68; Royle *Ill.* 341; Brandis *For. Fl.* 431.—Vern. *Pâpri*, *banchilla* (Saharanpur), *Kunj* and *dhama* (Oudh), *chilla* (Bundelkhand). Indian Elm.

A large spreading almost glabrous deciduous tree. *Bark* grey; branchlets lenticellate; young shoots often pubescent. *Leaves* more or less coriaceous, or sometimes almost membranous, 3-5 in. long, elliptic, acuminate, entire (those of the seedlings and shoots often serrate), glabrous and shining or sometimes pubescent beneath; base unequally rounded or subcordate; main lateral nerves 5-7 pairs; petioles about  $\frac{1}{3}$  in. long. *Flowers*  $\frac{1}{6}$  in. across. *Perianth* pubescent; segments 4-5-partite. *Stamens* usually 6 or 7; filaments glabrous, anthers pubescent. *Ovary* stalked, compressed, the jointed stalk lengthening as the fruit ripens; styles stigmatose on the inner side. *Samara* obliquely elliptic or suborbicular, about 1 in. in diam.; wing reticulately veined, notched at the apex.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Bundelkhand and in the forest tracts of Merwara. It is frequently met with near villages and in many gardens, within the area of this flora. The new leaves appear in March and April soon after the tree has flowered, and the fruit, which ripens during the hot season, remains for a long time on the tree. *DISTRIB.*: Outer Himalayan ranges from Jamu eastwards up to 2,000 ft., extending to Assam and Burma, and southwards from Bengal through Central, Western and South India to the dry region of Ceylon. The wood is used chiefly for fuel and charcoal. It emits a very unpleasant odour when freshly cut.

## 2. CELTIS, Linn.; *Fl. Brit. Ind.* V, 481.

Trees or shrubs, sometimes evergreen. *Leaves* alternate, bifarious, ovate, entire or serrate, base 3-nerved; stipules lateral, free. *Flowers* small, polygamous, solitary or cymose, male and androgynous cymes usually at the base of the shoots, the females in the upper axils. *Sepals* 4 or 5, imbricate. *Petals* none. *Stamens* 4 or 5, short, erect in bud, inserted round a woolly torus. *Ovary* sessile; style central, arms simple or lobed, plumose, ovule pendulous. *Fruit* a small ovoid or globose drupe; endocarp

hard, smooth or rugose. *Seed* with a membranous testa, albumen scanty or none, embryo curved; cotyledons broad, inflexed flat or replicate, surrounding the upcurved radicle.—Species about 60, in temperate and tropical regions chiefly in the N. Hemisphere.

**C. australis.** Linn. *Sp. Pl.* 1043; *Brandis For. Fl.* 428, t. 50; *Ind. Trees* 595; *F. B. I. V.*, 482; *Watt, E. D.*; *Kanjil For. Fl. (ed. 2)*, 360; *Gamble Man.* 629; *Collett Fl. Siml.* 455. *C. caucasica*, *Willd.*; *J. L. Stewart in Journ. Agri.-Hort. Soc. Ind. xiii, pt. 3, 299.*—*Vern. Kharak, kharak-chena* (Dehra Dun).—Nettle-tree.

A medium-sized deciduous tree with bluish-grey or brown bark which is often speckled with whitish dots and in large trees horizontally wrinkled; branchlets drooping; young branches, leaves and petioles more or less hairy. *Leaves* 3-5 in. long, obliquely ovate or ovate-lanceolate, acuminate, serrate or entire towards the base, rough and coriaceous when full-grown, dark-green and glabrous on upper surface; base acute or rounded, sometimes oblique and with 3 strong nerves, midrib pinninerved above; petioles  $\frac{1}{2}$  in., stipules subulate, shorter than petioles, caducous. *Flowers* pale-yellow, the females in the upper axils, long-pedicelled rather larger than the males. *Sepals* oblong, with woolly margins, deciduous. *Ovary* woolly. *Drupe* yellowish or black, ovoid or subglobose,  $\frac{1}{3}$  in. in diam. or less, its pedicel  $\frac{1}{2}$ -2 in., putamen rugose.

Dehra Dun, both planted and self-sown; it is probably wild in the forests of N. Oudh, (Wallich, Duthie); and in the Bijnor forests of Rohilkhand (Stewart). Flowers March-May, often before the leaves appear. *DISTRIB.* : W. Himalaya eastwards to Nepal up to 8,000 ft.; Punjab, on the Salt range; extending to Chitral, Afghanistan, Baluchistan, and westwards to S. Europe. The wood is strong and tough and is used in the manufacture of oars, whip-handles; agricultural implements, etc. In the south of France and in Spain the tree is much cultivated for such purposes. The sweet fruit is sometimes eaten, and the leaves are much used for fodder. The villagers on the lower slopes of the North-West Himalaya very frequently store their winter supplies of fodder in the forks of the branches of this tree.

**3. TREMA, Lour.**; *Fl. Brit. Ind. V.*, 483.

Shrubs or trees. *Leaves* alternate, 3-7-nerved at the base; stipules lateral, caducous. *Flowers* monoecious subdioecious or

polygamous, in small axillary cymes. *Perianth* simple. **MALE** flowers. *Sepals* 4 or 5, induplicate-valvate or subimbricate. *Stamens* 4 or 5, erect in bud. *Pistillode* small or none. **FEM.** flowers. *Sepals* as in male when stamens are present, flat and subimbricate in the absence of stamens. *Ovary* sessile; style central, with 2 linear arms, ovule pendulous. *Fruit* a small straight ovoid or subglobose drupe, usually tipped by the style, endocarp hard. *Seed* small, testa membranous, albumen fleshy, cotyledons narrow, radicle ascending.—Species about 20, in tropical and sub-tropical regions of the world.

Leaves distinctly unequal at the base, softly pubescent beneath . . . . . 1. *T. orientalis*.  
 Leaves almost equal at base, very scabrid on both surfaces . . . . . 2. *T. politoria*.

**1. *T. orientalis***, Blume *Mus. Bot.* ii, 62; *F. B. I. V.*, 484; Watt, *E. D.*, *Kanjilal For. Fl.* (ed. 2), 361; Gamble *Man.* 630; *Prain Beng. Pl.* 960; Cooke *Fl. Bomb.* ii, 631; Brandis *Ind. Trees* 597. *Sponia orientalis*, *Planch.*; *Royle Ill.* 341; Brandis *For. Fl.* 430. *Celtis orientalis*, *Linn.*; *Roxb. Fl. Ind.* II, 65;—Indian Nettle-tree or Charcoal-tree.

A small quick-growing short-lived evergreen tree; bark thin, dark-grey, with many lenticels. *Branches* spreading, straight; branchlets hairy. *Leaves* 2-3 in. long, obliquely ovate, acuminate, crenate-serrulate, rather rough on the upper surface, soft beneath with white pubescence; base unequally rounded or subcordate, 3-nerved, lateral nerves above the basal ones 3-4 pairs; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in.; stipules as long as the young petioles, deciduous. *Cymes* lax, spreading, pubescent, usually exceeding the petioles. **MALE FLOWERS**: *Sepals* elliptic-lanceolate. *Stamens* 5, longer than the sepals. *Pistillode* small. **FEM. FLOWERS**: *Sepals* as in the male. *Drupe* ovoid,  $\frac{1}{6}$  in. in diam., glabrous, black when ripe.

Dehra Dun, usually in swampy ground and eastwards along the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. Flowers during the greater part of the year. **DISTRIB.**: More or less throughout India, extending to Ceylon, the Malay Islands and China. This tree is remarkable for its sudden appearance in clearings of moist forest; it is also very useful for planting on landslips. The wood produces a good charcoal suitable for making gunpowder, and the inner bark yields a strong fibre much used for binding loads.

2. **T. politoria**, Flanch. in *Ann. Sc. Nat. Ser. 3, X, 326*; *Ind. Trees* 597; *F. B. I. V.*, 484; *Kanjilal For. Fl. (ed. 2)* 362; *Gamble Man.* 631; *Collett Fl. Siml.* 456; *Prain Beng. Pl.* 960. *Sponia politoria* Flanch.; *Brandis, For. Fl.* 430.—Vern. *Kagshi*, *kuri* (Dehra Dun), *Khardâ* (Saharanpur), *jaun* and *bâtu* (Bijnor), *banharria* (Oudh) *rabna* (Merwara).

A small sparingly branched evergreen tree with a short trunk and stout branchlets which are scabrid with firm white hairs swollen at the base. *Leaves* bifarious, 2-5 in. long, oblong or ovate-lanceolate, acuminate, serru late, very scabrous on both surfaces, dark-green and usually shining above, paler beneath; base nearly equal, rounded or cordate, 3-nerved; petiole  $\frac{1}{4}$  in. long, stipules exceeding the petioles. *Flowers* in compact cymes, usually monoecious. *Drupe* globose, seated on the persistent perianth.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Merwara (Lowrie). Flowers April-June. **DISTRIB.**: Salt range of Punjab and lower Himalayan valleys eastwards to Bhutan; Bengal, C. India and Mt. Abu in Rajputana. This tree, like the preceding, is very useful for planting on landslips. The foliage affords good fodder for cattle, and the inner bark yields a strong fibre. The hard rough leaves are much used for polishing wood and ivory.

4. **CANNABIS**, Tournef.; *Fl. Brit. Ind. V.*, 487.

A tall annual. *Leaves* alternate or the lower opposite, upper 1-3-, lower 5-11-partite, pinninerved; lobes lanceolate, serrate; stipules lateral. *Flowers* small, dioecious, rarely monoecious; males in axillary panicled cymes; females in axillary racemes; bracts in females convolute, leafy. **MALE** flowers. *Sepals* 5, imbricate. *Stamens* 5, erect in bud; filaments filiform, anthers oblong. *Pistillode* none, **FEM.** flowers. *Perianth* hyaline, embracing the base of the ovary. *Ovary* sessile, of 2 carpels, 1 fertile and 1 sterile, 1-locular; *ovule* pendulous, reversed, campylotropous; style central; arms 2, filiform, caducous. *Fruit* a somewhat compressed crustaceous nut. *Seed* somewhat flattened; albumen unilateral, fleshy, embryo curved; cotyledons broad, thick; radicle upcurved, incumbent.—A single species, wild in Central Asia, and possibly in Northern India.

**C. sativa**, Linn. ; Roxb. *Fl. Ind.* iii, 772 ; Royle *Ill.* 333 ; Madden in *Journ. As. Soc., Beng.* xvii (1848), pt. 1, 399 ; A. DC. *L'Orig. Pl. Cult.* 117 ; Duihie and Fuller in *Field and Gard. Crops* i, 80, t.t. 19 and 20 ; Watt E. D. ; *Comm. Prod. Ind.* 249 ; *F. B. I. V*, 487 ; Kanjilal *For. Fl.* (ed. 2) 385 ; Collett *Fl. Siml.* 456 ; Prain *Beng. Pl.* 960 ; in *Sc. Memb. Med. Depmt.* (New ser. 1904) No. 12 ; —Cooke *Fl. Bomb.* ii, 659. Vern. *Bhang, siddhi, ganja, charas*. (Hemp).

Abundant throughout the greater part of India in waste ground and by roadsides ; also widely distributed up to considerable elevations on the Himalaya, especially in the vicinity of habitations and on the sites of much frequented camping grounds along the principal trade-routes leading to C. Asia. For this reason it is difficult to ascertain to what extent, if at all, this plant may be regarded as truly indigenous in British India. The following are the more important products derived from this plant :—*charas, bhang, ganja*, also the fibre and the seeds. *Charas* is the narcotic resinous substance which appears on the stems and inflorescence, and is collected chiefly from cultivated female plants. This substance is imported into India chiefly from C. Asia where the drier climate is more suitable for its cultivation. *Bhang* consists of the dried leaves and flowers and is largely prepared in India, as also is *ganja*, the name given to the dried flowering tops of the cultivated female plant. Both *bhang* and *ganja* are often mixed with tobacco and smoked. The cultivation of the plant for its fibre (hemp) is mainly restricted to some of the warm valleys of the W. Himalaya between Nepal and Kashmir. The male plant yields the best fibre and is always cultivated, as the fibre yielded directly by the wild-growing plant is worthless. Hemp seeds are well known as a favourite food of cage-birds, and in India they are often roasted and eaten by the Himalayan villagers. For further information regarding this plant see Watt in *Commercial Products of India*, p. 249.

**5. GIRARDINIA**, Gaud. ; *Fl. Brit. Ind.* V, 550.

Herbs or undershrubs with stout stinging hairs. *Leaves* alternate, 3-nerved, entire or lobed, serrate ; stipules connate, foliaceous. *Flowers* in clusters, monoeious or sometimes diœcious ; clusters in simple or panicled spikes or heads, armed with stinging hairs. *Perianth* simple. *MALE* flowers. *Sepals* 4-5, valvate. *Stamens* 4-5, inflexed in bud, filaments free. *Pistillode* globose or cupular.

FEM. flowers. *Perianth* tubular, ventricose, 2-3-toothed, at length splitting on one side and spathe-like. *Ovary* straight; stigma subulate, papillose, ovule erect. *Fruit* a broad compressed achene, seated on the perianth, pericarp rather thick. *Seed* with a membranous testa, albumen scanty, cotyledons broad.—Species 7, in Trop. Asia and Africa.

**G. heterophylla**, *Dcne. in Jacquem. Voy. Bot. 151, t. 153*; *Brandis For. Fl. 404*; *F. B. I. V, 550*; *Kanjilal For. Fl. (ed. 2) 334*; *Gamble Man. 656*; *Collett Fl. Siml. 462, fig. 149*; *Watt Comm. Prod. Ind. 161*. *Urtica heterophylla*, *Willd.*; *Roxb. Fl. Ind. iii, 586*.—*Vern. Bichua, chichru, kushki*.

A coarse erect perennial herb 4-10 ft. high, closely beset with slender rigid sharp stinging hairs. *Leaves* 4-12 in. long and often as broad, broadly ovate, acuminate; base cordate or truncate; margins usually sharply and falcately dentate, rarely entire; under surface usually glabrous except for the bristly stinging hairs on the nerves; petioles 3-6 in. long, densely armed with stinging hairs; stipules about  $\frac{1}{2}$  in. long, ovate. *Flowers* small, monœcious, densely crowded. *Male flowers* in long slender often panicled spikes. *Perianth* 4-partite. *Stamens* usually 4. *Pistillode* globose. *FEM. flowers* crowded in simple or panicled spikes and usually forming a stout densely bristly inflorescence up to 6 in. long or more. *Perianth*  $\frac{1}{10}$  in. long, 3-lobed, splitting when the fruit ripens; lobes triangular, acute. *Style* filiform. *Achenes*  $\frac{1}{8}$  in. long, flat, obliquely ovate.

Abundant in Dehra Dun and eastwards along the Sub-Himalayan tract. Flowers during the rainy season. *DISTRIB.*: Sub-tropical and temp. Himalaya from Kashmir to Sikkim, up to 7,000 ft.; also in Assam and the Khasia Hills, extending to Burma, Java and China. The stems yield a strong silk-like fibre which is used for making twine or ropes, and sometimes (in Sikkim) a coarse kind of cloth is made from it. The leaves are often used as a vegetable by the village people of the Western Himalaya.

**VAR. zeylanica**, *F. B. I. l. c. 551*. *G. zeylanica*, *Dcne. l. c. 152*; *Prain Beng. Pl. 961*; *Cooke Fl. Bomb. ii, 633*. *Urtica zeylanica*, *Burm.*—Leaves pinnatifidly lobed; margins rather bluntly serrate; stipules broadly cordate; female inflorescence (in fruit) densely compacted into oblong or reniform masses. This variety occurs in the dry south-western hilly portion of the area of this flora and extends through Central India and the Deccan to Travancore and Ceylon. It is often known as the *Nilgiri nettle*, which name, however,

should more correctly be referred to *G. palmata*, Gaud. (*G. heterophylla*, VAR. *palmata*, F. B. I. l.c.) as being the more prevalent variety found on the Nilgiris.

**6. PILEA**, Lindl. ; Fl. Brit. Ind. V, 551.

Herbs, rarely undershrubs. Leaves opposite, in equal or unequal pairs, entire or serrate, 3-nerved at the base, rarely pinninerved; stipules connate, intrapetiolar. Flowers minute, monoeious or dioecious, in axillary long or short peduncled dichotomously branching cymes, bracts small or none. Perianth simple. MALE flowers. Sepals 2-4, free or connate in a cup, often gibbous or horned on the back. Stamens 2-4. Pistillode conical or oblong. FEM. flowers: Sepals 3, rarely 4, very small and unequal, dorsal longest, sometimes gibbous or hooded. Staminodes minute and scale-like or none. Ovary straight; stigma sessile, pinnicillate, ovule erect. Fruit an ovoid or oblong compressed membranous or crustaceous achene, sometimes clasped at the base by the persistent sepals. Seed erect, testa thin, albumen very scanty, cotyledons broad.—Species about 100, tropical or sub-tropical, none found in Australia.

**P. peploides**, Hook. and Arn. Bot. Beech. Voy. 96; F. B. I. v, 554.

A very small tufted glabrous herb, branching from the base. Stems or branches 3-5 in. long, succulent, flaccid. Leaves  $\frac{1}{2}$  in. long and broad, orbicular-ovate, rounded at the apex, entire or crenate above the middle; base cuneate, 3-nerved; petiole as long as the blade; stipules obscure. Flowers minute, indense sessile androgynous, globose heads  $\frac{1}{4}$  in. in diam. Schenes very minute sub-globose, smooth.

In the Kheri district of N. Oudh, and in the Gorakhpur district (Duthie's collectors). DISTRIB.: From the Punjab Himalaya to the Sikkim Terai also in Cachar and Burma, extending to China, Japan, Java and to the Sandwich and Galapagos Islands.

**P. Muscosa**, Lindl. A minute creeping herb with entire pinninerved leaves is often found as a garden weed in damp places and is known as the Gunpowder Plant owing to the profuse discharge of pollen from the anthers when the plant is shaken. It has been introduced from S. America.

7. **ELATOSTEMA**, Forst., Fl. Brit. Ind. V, 562.

Herbs or undershrubs. *Leaves* alternate or with sometimes a minute leaf sub-opposite to the normal leaf, distichous, sessile or sub-sessile, usually very oblique and unequal-sided, 3-nerved at or near the base; stipules lateral or intrapetiolar. *Flowers* very minute, crowded on sessile or peduncled unisexual usually involucrate receptacles; bracts oblong or ovate, the outer sometimes with a dorsal spur or horn, bases nearly free or more or less confluent in a fleshy circular or lobed disk, the tips usually projecting from its margin; bracteoles densely crowded, those of the male heads usually oblong, of the females spathulate; florets often in clusters, each cluster surrounded by a partial bract, giving the head a lobed appearance. *MALE* flowers. *Sepals* 4 or 5, two or more usually tubercled or spurred on the back. *Stamens* 4 or 5, inflexed in bud. *Pistillode* minute. *FEM.* flowers: *Sepals* 3-5, very minute, much shorter than ovary, persistent. *Staminodes* minute or none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* a minute ellipsoid or fusiform usually ribbed achene subtended by the very minute perianth. *Seed* usually exalbuminous, testa membranous, cotyledons ovate or semiterete.—Species about 50, tropics of the Old World except in Australia.

**E. sessile.** Forst. *Char. Gen.* 106, var. *polycephala*, *Hk. f. in F. B. I. V*, 563; *Collett Fl. Siml.* 466. *Procris punctata*, *B.-Ham. in Don Prod.* 61.

Stem 1-2 ft., often bent at the joints, prostrate and rooting below. *Leaves* sessile or nearly so, membranous, 4-8 in. long, obliquely obovate or oblong, coarsely serrate, the tip caudate, bright green when dry, cystoliths abundant on upper surface. *Receptacles* solitary or 2-3 together,  $\frac{1}{2}$ -1 in. diam., the males sessile, the fem. shortly stalked and without involucral bracts; bracteoles very minute, villous, hyaline. *Achenes* very minute, ellipsoid, acute at both ends, ribbed.

Dehra Dun, in shady ravines. **DISTRIB.** : Himalaya from the Punjab eastwards and up to 8,000 ft.; also in Assam, and southwards to the Nilgiri Hills and Ceylon; extending to trop. Africa, the Malay and Pacific Islands, China and Japan.

## S. BOEHMERIA, Jacq.; Fl. Brit. Ind. V, 575.

Shrubs or small trees. *Leaves* opposite or alternate, toothed, 3-nerved at the base; stipules usually free, deciduous. *Flowers* monoecious or dioecious, both sexes in axillary spicate racemed or panicled clusters; bracts small, scarious. *MALE flowers*: *Perianth* 3-5-lobed or partite, valvate. *Stamens* 3-5, inflexed in bud. *Pistillode* elevate or globose. *FEM. flowers*: *perianth* tubular, 2-4-toothed, angled winged or ventricose in fruit. *Ovary* included; stigma filiform, persistent, ovule erect. *Fruit* a crustaceous achene, at first closely invested by the perianth, at length free. *Seed* with membranous testa, ablumen copious or scanty, cotyledons ovate.—Species about 45, chiefly tropical.

Leaves all alternate—A tree . . . . . 1. *B. rugulosa*.

Leaves mostly opposite—Shrubs :—

Leaves lanceolate; petioles up to one inch long . . . . .

2. *B. macrophylla*.

Leaves broadly ovate or orbicular; petioles exceeding one inch :—

3. *B. platyphylla*.

Female spikes long, overtopping the terminal leaves . . . . .

4. *B. scabrella*.

Female spikes short, erect, not overtopping the terminal leaves . . . . .

1. *B. rugulosa*, Wedd. in Ann. Sc. Nat. Ser. 4, i, 200; Brandis For. Fl. 403; Ind. Trees 617; F. B. I. V, 577; Kanjilal For. Fl. (ed. 2), 380; Gamble Man. 657. *B. nervosa*, Madden in Journ. As. Soc. Beng. xvii, pt. 1, 587.—Vern *Geti, genthi* (Dehra Dun).

A small or medium-sized evergreen tree; young parts and under surface of leaves hoary; branches terete; bark brown, deeply fissured. *Leaves* alternate, coriaceous, 3-5 in. long, elliptic-lanceolate, acuminate, crenulate, rugulose and dark-green above, paler or velvety pubescent beneath strongly 3-nerved, the intervening veins and veinlets conspicuously anastomosing; petiole  $\frac{1}{2}$ -1 in. long; stipules ovate, connate. *Flowers* dioecious, in sessile globose clusters forming simple axillary spikes 3-8 in. long, each cluster in the axil of a cordate bract.

Dehra Dun, in shady ravines and eastwards along the Sub-Himalayan tracts. Flowers in the rainy season. *DISTRIB.*: Outer Himalayan ranges from the Sutlej to Bhutan, ascending to 4,000 ft.; also in Upper Burma.

The wood of this tree is much used by the villagers of Garhwal and Kumaon in the manufacture of many of their household articles, such as cups, boxes, combs, etc., also the vessels which they employ for holding milk. The tree is highly recommended for planting on dry bare slopes, and should be protected where found growing naturally in such situations.

**2. *B. macrophylla*,** *Don. Prod. 60; Brandis For. Fl. 403; Ind. Trees 617; F. B. I. V. 577; Watt E. D.; Kanjilal For. Fl. (ed. 2), 389; Gamble Man. 658.*—*Vern. Bara siaru* (Dehra Dun).

A short or small tree; bark greyish-brown, rough with small lenticels; branchlets stout, obtusely 4-angled, usually strigose. Leaves opposite, 6-12 in. long, lanceolate, caudate-acuminate, obtusely serrate, upper surface sparsely hispid, rugulose and pustular, softly or hispidly pubescent or glabrate beneath; petiole  $\frac{1}{2}$ -1 in. long; stipules lanceolate, midrib hairy. Spikes elongate, pendulous, leafless, simple or branched below. Clusters globose,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam.; bracts lanceolate. Fruit obovate, cuneate, compressed, ciliate, with a 2-4-toothed neck.

Ravines on Nagsidh Hill in Dehra Dun (Kanjilal), and in river-beds eastwards along the Sub-Himalayan tract. Flowers Aug.-Sep. DISTRIB.: Sub-tropical Himalaya from the Jumna to Mishmi, up to 4,000 ft., and from the Khasia Hills south to Chota Nagpur; also in Upper Burma and extending to China. The bark yields an excellent fibre of which fishing nets and lines are made.

**3. *B. platyphylla*,** *Don Prod. 60; Brandis For. Fl. 403; Ind. Trees 617; F. B. I. V. 578; Watt E. D.; Kanjilal For. Fl. (ed. 2) 381; Gamble Man. 658; Collett Fl. Siml. 466.*—*Vern. Siár* (Dehra Dun).

A large shrub up to 12 ft. high, with dark-brown and rather rough branches. Leaves mostly opposite, 4-9 in. long, broadly ovate, cordate elliptic or suborbicular, acuminate or caudate, coarsely toothed, more or less rugose, sparsely hispid-pubescent or glabrate on both surfaces; base 3-nerved; petiole 1-5 in. Flowers dioecious or monoecious. Male spikes often branching, generally not exceeding the leaves. Fem. spikes simple, far-exceeding the terminal leaves, becoming brown when achenes are ripe.

Shady ravines and banks of streams in Dehra Dun (Kanjilal), also in the Sub-Himalayan tracts eastwards. Flowers April-Aug. Widely distributed in India, and very variable, especially on the outer ranges of the Himalaya up to 5,000 ft. The bark yields a strong white fibre, and the foliage affords a good fodder for cattle.

**4. *B. scabrella*,** Gaud. in Freyc. Voy. 500; C. B. Clarke in Journ. Linn. Soc. XV, 124; Prain Beng. Pl. 964; Cooke Fl. Bomb. 636. *B. platyphylla* var *scabrella*, Wedd.; F. B. I. V, 578; Watt, E. D. *Urtica scabrella*, Roxb. iii, 581.

A shrub with soft glabrous or strigose branches. Leaves usually opposite,  $3\frac{1}{2}$ -7 in. long, broadly ovate obovate or sub-orbicular, acuminate or cuspidate, sharply serrate with triangular teeth, usually rugose and lacunose beneath; base rounded or cordate, 3-nerved; petioles 4 in. long; stipules lanceolate, acute. Flowers in small globose clusters on slender erect spikes. Male spikes crowded in the lower axils, the female spikes usually solitary, not exceeding the terminal leaves. MALE FLOWERS: Sepals 4, ovate, acuminate. FEM. FLOWERS: Perianth  $\frac{3}{10}$  in. long, pubescent, shortly contracted round the base of the persistent style into a small 4-toothed mouth. Achenes compressed, shining, closely invested by the turgid persistent perianth.

Dehra Dun and eastwards along the Sub-Himalayan tract. DISTRIBUT.: More or less throughout India from the outer Himalayan ranges; also in Ceylon.

**B. Nivea,** Gaud.; Brandis For. Fl. 402; F. B. I. V, 576; Watt E. D.; in Agril. Ledger No. 15 (1893); Comm. Prod. Ind. 143; Gamble Man. 657; Prain Beng. Pl. 964; Cooke Fl. Bomb. ii, 637. *Urtica nivea*, L.—This is the well-known *rheea* or China grass, a native of China, Japan and the Malay Islands. It yields a most valuable fibre and has been cultivated for several years in various parts of India. The expense, however, involved in its cultivation, and the difficulties met with in the extraction and preparation of the fibre have hitherto kept it in the background as a marketable fibre plant.

**B. Tenacissima,** Gaud. (*Urtica tenacissima*, Roxb.) is regarded by most authors as a tropical variety of the above, differing chiefly by having the under surface of its leaves green instead of pure white. It is found wild in the Malay Peninsula and its native name is *rāmi*.

**9. *POUZOLZIA*,** Gaud.; Fl. Brit. Ind. V, 580.

Herbs or undershrubs. Leaves alternate or the lower, rarely all, opposite, usually entire, 3-nerved at the base, smaller upwards,

the uppermost often reduced to bracts ; stipules free, often persistent. *Flowers* minute, usually monocious, in 1-sexual or androgynous clusters sessile in the axils of the leaves or bracts, bracteoles small, individual florets pedicelled. *MALE* flowers : *Perianth* 4 or 5-partite or lobed, rarely 3-part, ; lobes valvate, with concave or abruptly inflexed tips and transversely plicate bracts. *Stamens* 4 or 5, rarely 3. *Pistillode* clavate or oblong. *FER.* flowers : *Perianth* tubular, often beaked ; mouth contracted, 2-4-toothed, *Ovary* included, stigma filiform, jointed at the top of the ovary, soon deciduous, ovule erect. *Fruit* a small achene with brittle shining pericarp, enclosed in but usually free from the marcescent perianth. *Seed* with membranous testa, albumen very scanty or none, cotyledons ovate.—Species about 50, in the tropics of the Old World.

Lobes of male perianth usually 4, convex or gibbous on the back ; stamens 4, rarely 5 :—

Leaves toothed—A small shrub . . . . . 1. *P. viminea*.

Leaves quite entire—A perennial herb . . . . . 2. *P. indica*.

Lobes of male perianth 5, abruptly inflexed above the middle ; stamens 5—A perennial herb . . . . . 3. *P. pentandra*.

1. *P. viminea*, Wedd. in DC. Prod. xvi, i, 228; Brandis For. Fl. 405; Ind. Trees 617; F. B. I. V, 581; Kanjilal For. Fl. (ed. 2), 381, & Amble Man. 658. Collett Fl. Siml. 467; Boehmeria. frondosa, Don Prod. 59.

A small shrub with slender virgate pubescent or strigose branchlets. Leaves alternate,  $\frac{1}{2}$ -5 in. long, ovate or oblong-lanceolate, acuminate, dentate, smooth or scaberulous on the upper surface, strigose or pubescent beneath and often with a grey or white tomentum ; base 3-nerved ; petioles  $\frac{1}{2}$ -2 in. long, strigose. *Perianth* of male flowers 4-partite ; segments convex on the back. *Stamens* 4. *Fruit* angled or obscurely margined.

Dehra Dun, in moist shady ravines. Flowers during the rainy season. *DISTRIB.* : Himalaya from the Sutlej eastwards to Sikkim, ascending to 7,000 ft. ; also in Burma, Assam and in the Malay Peninsula and Islands. The leaves are eaten in Sikkim by the Lepchas as a cooked vegetable. The bark yields a fibre suitable for making ropes.

2. *P. indica*, Gaud. in Freyc. Voy. 503; F. B. I. V., 581; Collett Fl. Siml. 467; Prain Beng. Pl. 965; Cooke Fl. Bomb. ii, 638. *Urtica suffruticosa*, Roxb. Fl. Ind. iii, 584.

A perennial herb, very variable as to size and habit, glabrous, hoary or pubescent. Stem erect or prostrate, 6-20 in., stout or slender. Leaves opposite or alternate,  $1\frac{1}{2}$  in. long, ovate to lanceolate, obtuse, acute or acuminate, entire, hairy; base acute or rounded; lateral nerves 1 pair above the 3 basal ones; petioles  $\frac{1}{2}$  in.; stipules ovate, acuminate, ciliate. Flowers strigose with simple or hooked hairs. MALE FLOWERS: Sepals 4, dorsally rounded, acute. Stamens 4. Pistillode small, clavate. FEM. FLOWERS: Perianth tubular, persistent, ribbed, 2-fid. at the apex, closely investing the achenes. Achenes  $\frac{1}{10}$  in. long, broadly ovoid, shining.

Abundant within the area and often met with as a garden weed. DISTRIBUT.: Throughout trop and sub-trop. India and in Ceylon, ascending to 7,000 ft. on the Himalaya; eastwards to Burma and south to Malay Peninsula and Islands, also in China.

VAR. *alienata*, Wedd. in F. B. I. V. l.c. P. nana, Don Prod. 60. *Urtica alienata*, Linn.; Roxb. Fl. Ind. iii, 582. It differs from the type in having the leaves mostly opposite, long-petioled and ovate, and the leaf-base is usually rounded. It is said to be common in India, but I have seen no specimens from the Upper Gangetic Plain.

3. *P. pentandra*, Benn. Pl. Jav. Rar. 64, t. 14; F. B. I. V., 583; Watt E. D.; Collett Fl. Siml. 468; Prain Beng. Pl. 965; Cooke Fl. Bomb. ii, 638. *Urtica pentandra*, Roxb. Fl. Ind. iii, 583.

A tall erect glabrous perennial herb, 2-3 ft. high; stem terete below, usually angular above, diffusely branched. Leaves sessile or shortly stalked; the lower opposite, 1-4 in. long, oblong-lanceolate, acute or acuminate, strongly 3-nerved, ciliolate; the upper much smaller than the lower ones and mostly alternate, linear-oblong, acuminate or cuspidate, exceeding the flower-clusters, the base often cordate. Flowers in clusters in the axils of the floral leaves (bracts) of an erect or nodding terminal spike up to 18 in. long. MALE FLOWERS stalked, truncate in bud, ciliate. Perianth 5-partite. Stamens 5. FEM. FLOWERS: Perianth (in fruit) with 2 or 3 broad lateral wings.

Dehra Dun (Gamble and Duthie), Pilibhit (Duthie), Gorakhpur (Burkhill). DISTRIBUT. Trop. Himalaya from Kangra eastwards to Assam Khasia Hills and Bengal and south to Orissa and Kanara, extending to Afghanistan, Java and China. A very variable species of which four varieties are described in Fl. Br. Ind.

## 10. VILLEBRUNEA, Gaud. ; Fl. Brit. Ind. V, 589.

Trees or shrubs. *Leaves* alternate, petioled, entire or crenulate penninerved or 3-nerved at the base; stipules partially connate intrapetiolar. *Flowers* diœcious, densely capitately fascicled, fascicles solitary or laxly cymose; bracts small, often linear; bracteoles cup-shaped, sometimes connate. *MALE flowers*: *Perianth* 4-partite; segments ovate, acute, valvate or slightly imbricate, subglobose in bud. *Stamens* 4; *Pistillode* obovate—clavate. *FEM. flowers*. *Perianth* tubular, adnate to the ovary; mouth narrowed, minutely toothed. *Ovary* erect, covered by the adherent perianth; stigma sessile, small or discoid, ovule erect. *Fruit* a crustaceous achene, adnate to the slight fleshy perianth. *Seed* straight, often acuminate, testa membranous, albumen usually scanty, cotyledons broadly ovate.—Species about 8, in India and the Malay Archipelago extending to Japan.

*V. frutescens*, Blume Mus. Bot. Lugd. ii, 168; Brandis For. Fl. 406; Ind. Trees 610; F. B. I. V, 590; Watt & D., Kanjilal For. Fl. (ed. 2), 382; Gamble Man. 659; Collett Fl. Siml. 468. *Urtica frutescens*, Roxb. Fl. Ind. iii, 589.

A shrub or small tree with slender pubescent branches; bark dark-grey, rough. *Leaves* membranous, 4-8 in. long, elliptic, oblong lanceolate or ovate, rarely suborbicular, acuminate or caudate, crenulate except towards base; base rounded or subcordate, 3-nerved to the middle and penninerved above, sparsely pubescent on the upper surface, grey or white beneath with woolly hairs, or glabrate; petioles  $\frac{1}{2}$ -4 in. long; stipules  $\frac{1}{2}$  in., lanceolate, pubescent. *Flowers* in subsessile clusters or short cymes in the axils of the previous year's leaves. *Fruit* of many minute dry ovoid nuts, surrounded at the base by the fleshy perianth and bracteoles.

Dehra Dun, often found by the sides of water-courses, and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. *DISTRIB.*: Outer Himalayan ranges from the Sutlej to Sikkim, ascending to 5,000 ft.; also in Assam and on the Khasia Hills, and on the Nilgiris in S. India, extending to China and Japan. The fibre is used for ropes.

## 11. DEBREGEASIA, Gaud. ; Fl. Brit. Ind. V, 590.

Shrubs or trees. *Leaves* alternate, petioled, serrate-crenate, 3-nerved at the base; stipules connate, intrapetiolar, 2-fid. *Flowers*

monoecious or dioecious, in dense globose panicled spicate or sessile clusters, bracts of male clusters scarious. MALE flowers: *Perianth* usually 4 (rarely 3 or 5)-partite, lobes valvate. *Stamens* 4, rarely 3 or 5, inflexed in bud. *Pistillode* glabrous or woolly at the base. FEM. flowers: *Perianth* ovoid or obovoid, with a contracted and minutely toothed mouth, succulent in fruit. *Ovary* straight, included; stigma sessile, penicillate; ovule erect. *Fruit* an achene, at first adnate to the fleshy perianth. *Seed* with membranous testa, albumen copious or scanty, cotyledons short and broad.—Species 5, in Trop. Asia and Africa.

Flower-heads in 2-chotomous cymes; male sepals exceeding the bracteoles; leaves clothed beneath with ash-coloured tomentum . . . . 1. *D. velutina*.

Flower-heads sessile or subsessile; male sepals shorter than the bracteoles; leaves clothed beneath with snow-white tomentum . . . . 2. *D. hypoleuca*.

1. *D. velutina* Gaud. in Bot. Voy. Bonite t. 90; F. B. I. V, 590; Watt E. D.; Comm. Prod. Ind. 160; Kanjilal For. Fl. (ed. 2), 383; Gamble Man. 660; Cooke Fl. Bomb. ii, 640; Brandis Ind. Trees 618. *D. longifolia*, Wedd.; Brandis For. Fl. 405.—Vern. *Tushiári, siáru* (Dehra Dun).

A tall erect shrub or small tree; bark thin, brown, rough; branches and petioles pubescent or tomentose. Leaves 2-7 in. long, linear or oblong-lanceolate, acuminate, serrulate, upper surface rugose, pubescent or scabrid and dark-green, veins prominently reticulate; lower surface ashy-tomentose; base rounded or acute, 3-nerved and with 2-3 pairs from the mid rib above; petioles  $\frac{1}{2}$ - $\frac{1}{4}$  in.; stipules scarious, 2-fid. Flowers in compact heads, arranged in lateral 2-chotomous cymes. MALE FLOWERS: Sepals 4, exceeding the bracteoles. STAMENS 4. FEM. FLOWERS: *Perianth* tubular, with a small 4-toothed mouth. *Fruiting clusters*  $\frac{1}{2}$  in. in diam., consisting of an aggregation of fleshy perianths and their contained achenes.

Dehra Dun and eastwards along the Sub-Himalayan tracts. Flowers during July and Aug. and the fruit ripens during the cold seasons DISTRIB.: Sub-trop. Himalaya up to 5,000 ft. from Garhwal to Sikkim, also in Assam, and on the Khasia Hills; and from Konkan to S. India and Ceylon, extending to Java. The strong fibre yielded by the stems is used for ropes and bow-strings. The orange-coloured ripe fruit resembles a small raspberry and is eaten.

2. **D. hypoelucia**, Wedd. *Monogr.* 463, t. 15; *F. B. I. V*, 59, *Watt E. D.*; *Comm. Prod. Ind.* 160; *Kanjilal For. Fl.* (ed. 2) 383; *Gamble Man.* 660; *Collett Fl. Siml.* 468. *D. bicolor*, *Wedd. Brandis For. Fl.* 405. *Urtica bicolor*, *Roxb. Fl. Ind.* iii, 589; *Boehmeria salicifolia*, *Don Prod.* 60.—*Vern. Sansáru* (Dehra Dun).

A large shrub with a thin grey bark; branches and leaves beneath clothed with snow-white wool. *Leaves* somewhat coriaceous, 3-6 in. long, lanceolate or oblong-lanceolate, acuminate, serrulate, scabrid with minute round elevated white dots on the upper surface, densely clothed beneath with white tomentum; base rounded or acute; main nerves 3 from the base, and with 3-5 pairs from the midrib above; petioles  $\frac{1}{2}$ -1 in.; stipules 2-fid. *Flowers* usually dioecious, arranged in rounded sessile or subsessile axillary heads. **MALE FLOWERS**: *Sepals* 4, shorter than the bracteoles, white-tomentose outside. *Stamens* 4. **FEM. flowers**: *Perianth* tubular, narrowed to a minute 4-toothed mouth.

Dehra Dun and Siwalik range in the Bijnor district. Flowers in March and April and the fruit ripens June-Aug. **DISTRIB.**: Sub-tropical and Temp. Himalaya from the Sarda river in Kumaon westwards to the Indus, up to 6,000 ft.; also on the Punjab Salt range and extending to Afghanistan, W. Asia and Abyssinia. The fibre of the stems is much used for making ropes. The fruit becomes yellow when ripe and is eaten.

**12. MAOUTIA**, Wedd.; *Fl. Brit. Ind.* v, 592.

Shrubs. *Leaves* alternate, petioled, crenate, 3-nerved, white-tomentose beneath; stipules connate, intrapetiolar. *Flowers* minute, monococious or sometimes androgynous, in small cymose globose heads. **MALE flowers**: *Perianth* 5-part., valvate, *Stamens* 5, inflexed in bud. *Pistillode* woolly. **FEM. flowers**: *Perianth* none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* an ovoid achene, with a crustaceous or fleshy pericarp. *Seed* with membranous testa, cotyledons elliptic or oblong. Species 8, in Trop. Asia and Polynesia.

**M. Puya**, Wedd. in *Ann. Sc-Nat. Sér. 4, i*, 193; *Royle Ill.* 333; *Brandis For. Fl.* 406; *Ind. Trees* 619; *F. B. I. V*, 592; *Watt E. D.*; *Comm. Prod. Ind.* 163; *Kanjilal For. Fl.* (ed. 2), 384; *Gamble Man.* 660. *Boehmeria frutescens*, *Don Prod.* 59 (not of Thunb.). *Vern. Pua, poi* (Hind.), *dhaul-kágshi* (Dehra-Dun)—Nepal Hemp.

A shrub, with dark-grey bark marked with vertical lines of brown lenticles; branches clothed with long soft hairs. *Leaves* membranous, 4-8 in. long, elliptic, caudate-acuminate, coarsely dentate with large triangular teeth, scabrid above, intensely white beneath with densely matted soft hairs except on the pubescent nerves, prominently 3-nerved from the rounded or subacute base, and with 3-4 pairs of lateral nerves from the midrib above; petioles 1-5 in. long; stipules lanceolate, 2-fid. *Flowers* minute, in small round unisexual or androgynous heads which are arranged in slender axillary and terminal cymose panicles shorter than the petioles. *Achenes* gibbously ovoid, trigonous, hispid.

Dehra Dun, and Siwalki Range, in ravines and on banks of streams; also eastwards along the Sub-Himalayan tract. Fl. and fr. May to November. *DISTRIB.*: Outer Himalaya eastwards from Garhwal up to 4,000 ft.; also on Khasia Hills and extending to Burma and Japan. The plant yields a strong fine white fibre suitable for making fishing nets and lines, and was formerly known as the wild *rhea* of Sikkim.

**13. MORUS, Linn. ; Fl. Brit. Ind. v, 491.**

Trees or shrubs with milky juice. *Leaves* alternate, entire or toothed or 3-lobed, base 3-5-nerved; stipules small, lateral, caducous. *Flowers* monococious or dioecious, spicate. *MALE* flowers in elongate catkin-like spikes. *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud. *Pistillode* turbinate. *FEM.* flowers in long and cylindric, or in short oblong or subglobose spikes. *Sepals* 4, decussate, imbricate, accrescent and succulent in fruit. *Ovary* included, straight, 1-celled; style central, 2-part. or 2-fid.; ovule pendulous. *Fruit* of many achenes enclosed in the succulent perianths and aggregated in berrylike spikes or heads. *Seed* subglobose, albumen copious, fleshy, embryo incurved; cotyledons oblong, equal, radicle ascending. Species about 10, in temperate and tropical regions.

**1. M. indica, Linn. Sp. Pl. 986; Rorb. Fl. Ind. iii, 596; Royle Ill. 337; Brandis For. Fl. 408; Ind. Trees 612; F. B. I. V, 492; Watt E. D.; Comm. Prod. Ind. 785; Kanjilál For. Fl. (ed. 2) 365; Gamble Man. 635; Prain Beng. Pl. 968; Collett Fl. Siml. 457; Cooke Fl. Bomb. ii, 658; M. parvifolia, Royle l. c.—Vern. *Tut, tutrisia tut, sia tunt.* Small-leaved mulberry.**

A deciduous tree or shrub. *Leaves* ovate, caudate-acuminate, coarsely and unequally serrate, 2-5½ in. long, pubescent or scabrous when old. *Male spikes* lax, on short slender peduncles. *Fem.* spikes short, ovoid. *Sepals* 4, the two inner flat or concave, the outer ones more less keeled; *styles* long, hairy, connate high up. *Fruit* dark-purple when ripe.

Wild on the outer Himalayan ranges up to 7,000 ft., and on the Sub-Himalayan tract eastwards to Sikkim and Upper Burma. It is largely cultivated as a shrub in Bengal and Burma for feeding silk-worms, as well as on the Nilgiri Hills. In N. India the new foliage and flowers appear in February and March and the fruit ripens in May. The wood is hard and close-grained.

2. *M. laevigata*, Wall. Cat 4649; Royle Ill. 337; Brandis For. Fl. 409; Ind. Trees 613; Gamble Man. 636; Prain Beng. Pl. 968; Cooke Fl. Bomb. ii, 658. *M. cuspidata*, Wall.-Vern. Tut.

A large or medium-sized tree; young shoots stipules and bud-scales clothed with long soft hairs. *Leaves* 3-7 in. long, ovate, cuspidate, finely serrate, often cordate at the base; petioles 1-1½ in. *Spikes* drooping, male spikes very hairy, the female almost glabrous. *Sepals* of fem. thin, two inner flat, outer ones keeled. *Styles* nearly free, papillose from base. *Fruit* long, cylindric, yellowish-white, insipid.

Tropical and subtrop. Himalaya from the Indus to Assam, wild and cultivated, ascending to 4,000 ft., also in Burma. A variety (*M. viridis*, B.-Ham.) with the leaves rounded at the apex is cultivated in Behar.

3. *M. alba*, Linn.; Royle Ill. 336; Roxb. Fl. Ind. iii, 594; DC. L'Orig. Pl. Cult. 119; Brandis For. Fl. 407, t. 47; Ind. Trees 612; F. B. I. V, 492; Wait E. D.; Comm. Prod. Ind. 784; Gamble Man. 634; Kanjilal For. Fl. (ed. 2) 364; Collett Fl. Siml. 457; Cooke Fl. Bomb. ii, 658. *M. tatarica*,—Vern. Tut, tuntri.-White Mulberry.

A small or medium-sized deciduous tree; young parts petioles and underside of leaves more or less pubescent. *Leaves* 2-3 in. long or more, ovate, acute, dentate or often lobed; upper surface usually glabrous; base cordate; petioles ½-1 in. *Flowers* on short ovoid spikes, monœcious, the male and female often on distinct branches. *Sepals* of fem. fls. 4, the two inner flat or concave, the outer ones keeled. *Styles* free. *Fruiting spikes* white or red, sweet.

This is the Mulberry which has been used chiefly throughout north-western India for supplying food for silkworms. For this purpose, as well as for the sake of its edible fruit, it is widely cultivated in the Punjab, Kashmir and in many other parts of the N. W. Frontier. Although often met with as apparently wild in many places, its original home is probably in N. Asia or China. Within the area of this flora the young leaves and the flowers appear in February. The fruit, which ripens during May and June is much eaten by the People, by whom many distinct forms are recognized, varying in the size of the tree and in the shape and colour of the fruiting spikes. The wood is much used in making furniture and agricultural implements, and on many of the Punjab rivers for boat-building. The leaves afford excellent fodder for sheep and goats, and the twigs are used for binding loads.—Closely allied to the preceding species is *M. ATROPURPUREA*, Roxb. *Fl. Ind.* iii, 595. It was introduced from China, and is now cultivated in various parts of India. The leaves are cordate, serrate and rarely lobed, smooth, and the long cylindric fruiting spikes are dark-purple when ripe.—*M. NIGRA*, Linn.; *Brandis For. Fl.* 407; *D. C. L'Orig. Pl. Cult.* 121. Vern *Sháh tut*. (Black Mulberry). This tree is extensively cultivated in the Peshawar Valley, in Kashmir, also in many parts of the N. W. frontier, and beyond in Baluchistan and Afghanistan. It is also grown in Europe, in W. and Cent. Asia and in China. Its original home is not known with certainty, though it is said to be wild in Persia, whence it was introduced into Greece and Italy.—*M. SERRATA*, Roxb. *Fl. Ind.* iii, 596; *Brandis For. Fl.* 409; *Ind. Trees* 612; *Gamble. Man.* 635; *Kanjilal For. Fl.* 365.—Vern. *Kimu, himu, tut, tunt*.—A large deciduous tree, cultivated in Dehra Dun, but wild on the outer ranges of the W. Himalaya up to 9,000 ft. Leaves 2-8 in. long, broadly ovate-cordate, acuminate, coarsely toothed or serrate, softly pubescent beneath. Flowers dioecious. Styles hairy, connate below. Fruit shortly cylindric, purple and sweet when ripe. The wood, which seasons well and takes a fine polish, is valued for cabinet work and is also used for making agricultural implements and tennis bats. The tree is often lopped for cattle fodder.

**14. STREBLUS, Lour. ; Fl. Brit. Ind. v, 489.**

Unarmed shrubs or trees with milky juice. *Leaves* alternate, pinninerved, scabrid; stipules small, lanceolate. *Flowers* axillary, usually dioecious; males in peduncled heads or spikes; fem. flowers solitary or 2-4 together, stalked, bracteate. *MALE flowers*. Sepals

4, imbricate. *Stamens* 4, inflexed in bud. *Pistillode* dilated at the top. *FEM.* flowers. *Sepals* 4, imbricate, embracing the ovary. *Ovary* straight, retuse; style central, with very long arms, ovule pendulous. *Fruit* membranous, straight, subglobose, laxly covered by the persistent perianth. *Seed* globose, testa membranous, albumen none, embryo globose; one cotyledon very large, fleshy, embracing the smaller one and the ascending radicle.—Species 2, Indian and Malayan.

**S. asper**, *Lour. Fl. Cochinch. ii*, 615; *Brandis For. Fl.* 410; *Ind. Trees* 615; *F. B. I. V.* 489; *Watt E. D.*; *Kanjilal* (ed. 2), 362; *Gamble Man.* 632; *Fraim Beng. Pl.* 962; *Cooke Fl. Bomb. ii*, 642. *Trophis aspera*, *Retz.* (excl. *syn.*); *Roxb. Fl. Ind. iii*, 761.—*Vern. Siora* (Hind.), *dahia* and *kuchna* (Saharapur), *rusa* (Oudh).

A small usually gnarled evergreen tree attaining 20 ft. in height, but very frequently merely a shrub. Bark thick, soft, grey or greenish-white or brown, becoming rough when old. Branchlets many, rigid and often much interwoven, pubescent. Leaves 2-4 in. long, elliptic or rhomboid, or obovate, acute or acuminate, margins more or less toothed towards the apex, rough on both surfaces with minute raised dots especially beneath; main lateral nerves 4-6 pairs; petioles about  $\frac{1}{3}$  in. long; stipules obliquely lanceolate. *Flowers* usually dioecious. **MALE FLOWERS** in shortly stalked globose heads. *Perianth* campanulate. *Sepals* hairy outside. **FEM. FLOWERS** solitary, on slender axillary usually fascicled pedicels  $\frac{1}{2}$  in. long. *Fruit* a 1-seeded subglobose berry about the size of a pea, yellow when ripe.

Common along river-banks and in hedges near villages, especially in Bundelkhand and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Jan.-March, fruiting May-July. The new leaves appear in March. **DISTRIB.** Along the base of the W. Himalaya eastwards to Bengal and through C. W. and S. India to Ceylon; extending to Burma, Siam and China. The wood of this tree resembles that of a fig. It is useful, however, by reason of its toughness and elasticity. The rough leaves are used for polishing wood and ivory. The tree is much lopped for fodder, and the fruit is eaten.

### 15. CUDRANIA, Trecul; Fl. Brit. Ind. v, 538.

Shrubs, often scandent, or small trees, usually spinous. *Leaves* alternate, entire, pinninerved; stipules lateral, small. *Flowers*

dicocious, bracteolate. MALE FLOWERS: *Sepals* 3-5, oblong, obtuse, adnate to 2-4 bracts, imbricate. *Stamens* 4, erect, more or less adnate to the sepals. *Pistillode* subulate or obsolete. FEM. FLOWERS: *Sepals* broader than in the male, embracing the ovary. *Ovary* straight; style terminal, simple or 2-armed; arms stout or slender; ovule pendulous. *Fruit* of ovoid compressed crustaceous achenes enclosed in the enlarged fleshy bracts and perianth and forming globose and fleshy heads. *Seed* with a membranous testa, albumen scanty, cotyledons twisted and folded, embracing the slender upcurved radicle.—Species 3 or 4, in Asia, E. Africa, Australia and New Caledonia.

*C. javanensis*, Trecul in *Ann. Sc. Nat. Sér. 3*, VIII, 123; Brand. For. Fl. 425; Ind. Tress 614; F. B. I. V., 538; Watt E. D.; Kanjilál For. Fl. (ed. 2), 378; Gamble Man. 651; *rain Beng. Pl.* 970.—*Vern. Manda*.

A large straggling or subscandent spiny shrub or small tree; bark smooth, thin, yellowish-brown, with oblong horizontal lenticels; branchlets pubescent; spines usually curved. *Leaves* glabrous subcoriaceous, 1-4 in. long, oblong or obovate to oblanceolate, obtuse, acute or acuminate; base obtuse; lateral nerves slender, 8-10 pairs; petioles  $\frac{1}{4}$  in. or less. *Flower-heads* solitary or in pairs, pubescent; the males  $\frac{1}{2}$  in. across; the female-heads enlarging to  $\frac{3}{4}$  in. in diam. when in fruit. FEM. FLOWERS: *Perianth-lobes* 4, thickened and velvety at the tips. *Styles* 2-fid. *Fruit* an irregularly shaped compound berry somewhat resembling a small custard-apple (*Anona*), pinkish-orange and velvety when ripe.

Dehra Dun and Siwalik range and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Apr.-June, and the fruit ripens in Aug. DISTRIBUT: Trop. Himalaya from the Sutlej eastwards to Sikkim; also Khasia Hills, E. Bengal, Orissa and Ceylon; extending to Burma, the Malay Peninsula, China, East Africa and Australia. The wood is used as fuel and the ripe fruit is eaten. The leaves of this shrub are often attacked by a fungus which converts them into a whitish brittle mass. This substance which is known by the name of 'Mande-ki-roti' is eaten by the villagers in Dehra Dun. This shrub bears a great resemblance to *Plecospermum spinosum* both in habit and foliage, but in the latter the stamens are inflexed in bud, as in the tribe *Moree*, and the spines are and more slender and nearly straight. I have seen no specimens of *Plecospermum* from within the area of this flora and I am inclined to believe that *Cudrania javanensis* has often been mistaken for it.

## 16. ARTOCARPUS, Forst. ; Fl. Brit. Ind. v, 539.

Evergreen trees with milky juice. *Leaves* alternate, coriaceous, often very large, entire or pinnately lobed, pinninerved, stipules lateral. *Flowers* monocious, densely crowded on globose or oblong unisexual solitary usually axillary receptacles often mixed with scale-like bracts peltate bracts. *MALE FLOWERS* : *Perianth* 2-4-lobed or partite; lobes obtuse, concave, valvate or slightly imbricate. *Stamen* 1, erect. *Pistillode* none. *FEM.* flowers. *Perianth* tubular, confluent below with the receptacle, limb minute. *Ovary* straight, style central or lateral; stigma entire, rarely 2-3-fid., ovule pendulous. *Fruit* a much enlarged fleshy oblong cylindric globose or lobed receptacle, clothed bearing on its outer surface the accrescent fleshy perianths and carpels (anthocarps), which have hard spinous or truncate or paramidal or flat apices. *Achenes* deeply sunk in the fleshy mass. *Seed* pendulous, exalbuminous, embryo straight or incurved, cotyledons fleshy; radical very short, superior.—Species about 40, in Trop. Asia, Malaya, China and the Pacific Islands.

**A. Lakcocha**, Roxb. Fl. Ind. iii, 524; Royle Ill. 337; Brandis For. Fl. 426; Ind. Trees 612; F. B. I. V., 543; Watt E. D.; King in Ann. R. Bot. Gard. ii, 14, t. 13; Kanjilal For. Fl. (ed. 2), 379; Gamble Man. Ind. Timb. 655; Prain Beng. Pl. 971; Cooke Fl. Bomb. ii, 657.—Vern. *Barhal, dheu*.

A large deciduous tree 50—60 ft. high, with a wide-spreading head; bark thick, rough, dark-grey; young parts clothed with soft grey or tawny tomentum. *Leaves* subcoriaceous, 4-12 in. long, oblong elliptic or subobovate, entire or (or the young shoots) sometimes serrate, dark-green glabrous and shining above, softly tomentose beneath; base rounded or truncate; main lateral nerves 6-12 pairs with conspicuous reticulations between; petioles  $\frac{1}{2}$ -1 in. long, pubescent when young; stipules lanceolate, caducous. *Flowers* in axillary globose shortly stalked heads, the male and female heads from different axils; bracteoles peltate, puberulous. *MALE FLOWERS* : *Sepals* 2-3, truncate, puberulous. *Stamen* 1, its filament tapering from a broad base; anther exserted, short, broad, 2-celled. *FEM. FLOWERS* : *Fruit-clusters* 2-3 in. in diam. lobulate, smooth, velvety. yellow when ripe. *Achenes* surrounded by the fleshy perianths, the whole immersed in a common fleshy receptacle.

Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in swampy ground. Often planted in gardens within the area and by roadsides. The leaves fall during the cold season and are again renewed with the flowers at the beginning of the hot season. *DISTRIB.* : Trop. and Subtrop.-Himalaya, ascending to 4,000 ft. in Kumaon, also eastwards to Burma and south to Travancore Ceylon and Malacca. The fruit is largely eaten by the natives of India, either cooked or raw, or as a pickle. A fibre suitable for cordage is obtained from the bark, and the wood yields a yellow dye.

A. *INTEGRIFOLIA*, Linn. f. *Suppl. 412*. A large evergreen tree with leaves 4-8 in. long, thickly coriaceous and glabrous. *Fruit* 1-2½ ft. long. The tree is largely cultivated throughout the warmer parts of India and in Burma and is quite wild in the forests of the Western Ghats. The fruit, which is known generally as the *Jack-fruit*, is much eaten as are also the seeds which are cooked. The wood, which somewhat resembles that of mahogany, has been extensively used in the manufacture of furniture.

A. *INCISA*, Linn. f. *Suppl. 411* is the *Bread-fruit tree*, a native of the Pacific Islands. It is cultivated in some of the hottest parts of India, but it does not thrive well if planted at any great distance from the sea.

17. *FIGUS*, Linn. ; Fl. Brit. Ind. v, 494.

Trees or shrubs, sometimes scandent or epiphytic; juice milky. *Leaves* alternate, rarely opposite, entire lobed toothed or serrate; stipules enveloping the bud, cadaceous. *Flowers* minute, usually monœcious, on the inner walls of a fleshy receptacle, the mouth of which is closed by imbricate bracts; florets often mixed with bracteoles, of four forms: male, female, gall and (rarely) neuter; receptacles usually androgynous, the males nearest the mouth; male fem. and gall flowers sometimes occur in the same receptacle, or males and galls may be in one set, females and neuters in another, or males and galls in one set, females only in another. *MALE flowers*: *Perianth* 2-6-fid, or-partite. *Stamens* 1 or 2, rarely 3-6, erect in bud. *NEUTERS*. *Perianth* as in males. *FEM. flowers*: *Perianth* as in the male or imperfect or obsolete. *Ovary* straight or oblique, style excentric; stigma entire or 2-armed, acute or obtuse; ovule pendulous. *GALL flowers*: *Perianth* as in female. *Ovary* containing the pupa of a hymenopterous insect; style short, often dilated upwards. *Fruit* an enlarged hollow cup-shaped closed recep-

tacle, the inner wall studded with crustaceous or fleshy achenes. Seed pendulous, testa membranous, albumen scanty, embryo curved, radicle ascending.—Species about 600, mostly tropical.

For full information regarding the figs of British India see Sir George King's valuable monograph published in Vol. I of the Annals of the R. Botanic Garden, Calcutta in 1888.

Section I. PALÆOMORPHE. Male flowers with 1 stamen and a rudimentary pistil in the same receptacle with gall flowers; female flowers in separate receptacles :—

A large epiphytic climbing shrub with thinly coriaceous leaves and small stalked globose receptacles . . . . .

1. *F. parasitica.*

Section II. UROSTIGMA. Flowers unisexual, rarely neuter. Male gall and fem. flowers in the same receptacle. Male flowers usually monandrous. Leaves alternate, entire, rarely membranous (see *F. infectoria*). Receptacles axillary or from the scars of fallen leaves, 3-bracteate at the base.—Usually trees or powerful climbers, epiphytic at least in early life :—

Petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, rarely (in *F. bengalensis*) as much as 2 in., never jointed to the blade :—

Receptacles sessile :—

Leaves more or less hairy, at least when young, main lateral nerves much stronger than the secondary ones :—

Leaves obtuse at the apex, glabrous above, puberulous beneath when young; petioles up to 2 in. long; receptacles globose,  $\frac{1}{2}$  in. in diam., red and downy when ripe.—A large wide-spreading tree with many aerial roots from the main branches . . . . .

2. *F. bengalensis.*

Leaves bluntly apiculate, persistently tomentose; petioles 1 in. long; receptacles globose,  $\frac{1}{2}$  in. in diam., grey-tomentose.—A large tree with a few aerial roots from the main branches . . . . . 3. *F. tomentosa*.

Leaves small, glabrous on both surfaces; nerves close, the primary lateral ones hardly stronger than the secondary; receptacles about  $\frac{1}{3}$  in. in diam., smooth, yellowish or red when ripe.—A large evergreen tree with usually a few aerial roots from the lower branches, often epiphytic . . . . . 4. *F. retusa*.

Receptacles distinctly stalked; leaves elliptic-oblong or lanceolate, bluntly acuminate at the apex and narrowed to the 3-nerved base, glabrous and shining above.—A tall evergreen tree . . . . . 5. *F. glaberrima*.

Petioles rarely less than 2 in. (See *F. infectoria*), sometimes jointed to the blade:—

Leaves 5-7 nerved at the base:—

Leaves terminating at the apex in a slender tail about  $\frac{1}{2}$  the length of the blade; base rounded or truncate; stipules minute . . . . . 6. *F. religiosa*.

Leaves narrowed at the apex into a cusp about  $\frac{1}{4}$  the length of the blade; stipules  $\frac{1}{2}$ -1 in. long:—

Base of leaf truncate or slightly narrowed into the petiole, usually 5-nerved; receptacles sessile, in pairs, axillary or from leaf-scars.—  
A medium-sized tree . . . . . 7. *F. Rumphii*.

Base of leaf usually cordate, never narrowed into the petiole, always 7-nerved; receptacles usually shortly stalked, in pairs or clusters from below the leaves.—A small glabrous tree or shrub, often epiphytic . . . . . 8. *F. Arnottiana*.

Leaves 3-nerved at the base, the apex abruptly acuminate.—A large spreading deciduous glabrous tree, often an epiphyte in early life . . . . . 9. *F. infectoria*.

Section III. SYCIDIUM. Flowers unisexual. Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male flowers monandrous.

Leaves alternate, polymorphous, entire toothed or variously lobed, more or less scabrid on both surfaces.—A small creeping shrub, rarely an epiphyte . . . . . 10. *F. heterophylla*.

Section IV. COVELLIA. Flowers unisexual. Male and gall fls. in same receptacle; female fls. in separate receptacles. Male fls. monandrous; sepals 3-4. Perianth of fem. fls. gamophyllous, short or none, rarely of 4-5 sepals. Leaves alternate or opposite. Receptacles on long leafless branches from near the base of the stem or subhypogaeal, or on tubercles of the trunk, and larger branches, rarely axillary:—

Receptacles in the leaf-axils, or in fascicles from the stem and larger branches:—

Leaves ovate-oblong or subobovate, usually opposite; receptacles axillary and from tubercles on the stem.—A shrub or medium-sized tree with hollow branches . . . . . 11. *F. hispida*.

Leaves narrowly lanceolate or oblanceolate, opposite, crowded; receptacles solitary, stalked, subglobose, axillary or on short leafless branches from the old wood; young parts densely but deciduously hirsute.—A low shrub, usually found in rocky beds of streams . . . . . 12. *F. laminosa*.

Receptacles in pairs or clusters on scaly usually leafless branches from near the base of the trunk; leaves alternate, more or less scabrid or hispid-pubescent, basal lobes very unequal.—A low tree with reddish bark. . . . . 13. *F. Cunia*.

Section V. EUCYCE. Flowers unisexual. Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male fls. usually diandrous (rarely 1-andr. in *F. scandens*, or 3-andr. in *F. foveolata*). Receptacles axillary, usually small.—Scandent or erect shrubs or small trees, rarely epiphytic. Creeping or climbing shrubs :-

Leaves broadly ovate or elliptic, their length not twice the breadth; male fls. rarely 1-andr.; receptacles on long stalks.—A scandent or creeping shrub, often rooting from the nodes . . . . 14. *F. scandens*.

Leaves oblong, their length more than twice the breadth; male fls. rarely 3-andr.; receptacles sessile or nearly so.—A creeper or lofty climbing shrub . . . . 15. *F. foveolata*.

An erect shrub or small tree with more or less scabrid entire toothed or 3-5-lobed leaves; receptacles stalked . . . . 16. *F. palmata*.

Section VI. NEOMORPHE. Flowers unisexual. Male and gall fls. in one set of receptacles, fem. fls. in a separate set (except in *F. glomerata* which has male fem. and gall fls. in the same receptacle as in Sect. Urostigma). Male fls. 2-andr. (rarely 3-andr. in *F. Roxburghii*). Perianth inflated, 3-4-sepalous. Receptacles often very large, in clusters from tubercles on the stem and larger branches, or in *F. glomerata* with a few axillary pairs.—Trees with alternate leaves, never epiphytic :-

Leaves subcoriaceous, 5-15 in. long, broadly ovate or rounded, usually deeply cordate at the strongly 5-7-nerved base; receptacles  $2\frac{1}{2}$  in. in diam. or more, in clusters low down on the trunk . . . . 17. *F. Roxburghii*.\*

Leaves membranous, 4-7 in. long, ovate-oblong or elliptic-lanceolate, rounded or acute at the 3-nerved base; receptacles 1-1½ in. across, on scaly stalked panicled branchlets from the trunk and larger branches, rarely in the leaf-axils . . . . 18. *F. glomerata*.

1. **F. parasitica**, Koen. ex Willd. in *Mém. Acad. Berol.* 1798, 102; *Brandis For. Fl.* 420. *F. gibbosa*, Blume, var. *parasitica*, King Sp. *Ficus* 6, t. 2, fig. B; *F. B. I. V.*, 497; Watt E. D.; *Kanjilal For. Fl.* (ed. 2) 368; *Prain Beng. Pl.* 979; *Cooke Fl. Bomb. ii*, 644; *Brandis Ind. Trees* 599. *F. Ampelos*, Koen.; *Roxb. Fl. Ind. iii*, 553. *F. sclerophylla*, Roxb. l. c. 546.—Vern. *Chhanchri* and *dádu-banda* (Dehra Dun).

Usually an epiphytic climber; branchlets scaberulous; bark thin, smooth, greenish-yellow. Leaves alternate, thinly coriaceous, 3-6 in. long, more or less rhomboid, obtuse acute or acuminate, minutely hispid above, scabrid and minutely hispid beneath; base acute, often unequal-sided, 3-nerved; main lateral nerves 3-7 pairs, prominent beneath and joining within the margin; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in.; stipules about as long as the petioles, ovate-lanceolate, convolute. Receptacles stalked, solitary or in pairs or fascicled, axillary and from below the leaves,  $\frac{1}{2}$ - $\frac{1}{2}$  in. across, depressed-globose or subpyriform, without basal bracts, scabrid and mammillate, yellow when ripe; peduncle as long as the receptacle, bracteate at the base. MALE FLOWERS near the mouth of the receptacles containing gall flowers. Sepals 4-6, linear, fleshy, hairy. Stamen 1, filament short, united at the base to an abortive pistil. GALL FLOWERS: *Perianth* as in the male. Ovary globose, smooth; style short, lateral. FERTILE FLOWERS in separate receptacles. Sepals 4, hyaline. Style elongate, lateral. Achene obliquely ovoid, slightly papillose.

Dehra Dun and eastwards along the Sub-Himalayan forest tracts; also in Bundelkhand; often found as an epiphyte on other species of *Ficus*, such as pipal and banyan. Receptacles ripen Jan.-March. DISTRIB. Throughout India and in Ceylon extending to Burma and the Andaman Islands. The rough leaves are used for polishing ivory and wood, and the root-bark is used in native medicine; the leaves are given as fodder to cattle.

2. **F. bengalensis**, Linn. *Hort. Cliff.* 471 No. 4; *Brandis For. Fl.* 412; *Ind. Trees* 600; King Sp. *Fic.* 18, t. 13; *F. B. I. V.*, 499; Watt E. D.; *Comm. Prod. Ind.* 536; *Collett Fl. Siml.* 459; *Kanjilal For. Fl.* (ed. 2), 369; *Gamble Man.* 638; *Prain Beng. Pl.* 979; *Cooke Fl. Bomb. ii*, 645. *F. indica*, Linn.; *Roxb. Fl. Ind. iii*, 539; *Royle Ill.* 339.—Vern. *Bor. bar, bargat*—The Banyan tree.

A large nearly evergreen tree sometimes up to 100 ft. in height; branches horizontally spreading and throwing down at intervals a succession of aerial roots which form supports for the indefinite elongation of

the main branches by which the circumference of this tree is extended. Young parts softly pubescent. *Leaves* coriaceous, 4-8 in. long, ovate or orbicular-ovate to elliptic, obtuse, entire, glabrescent above, glabrous or minutely pubescent beneath; base rounded or subcordate and with 3-7 nerves, the upper lateral nerves about 5-7 pairs and with conspicuous reticulate venation between; petioles stout  $\frac{1}{2}$ -2 in. long; stipules 1 in. long, coriaceous. *Receptacles* axillary, sessile in pairs, globose, about 1 in. in diam., puberulous and red when ripe and with  $\frac{1}{3}$  broad rounded subglabrous coriaceous basal bracts. **MALE** flowers many, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. **GALL** flowers: *Perianth* as in male. **Style** short. **FERTILE** flowers: *Perianth* shorter than in the male. **Style** elongate.

Common in the sil forests of Dehra Dun and Saharanpur and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also largely planted by Hindus near villages and in the vicinity of their temples. The new leaves appear March to May. **DISTRIB.**: Universally distributed throughout the plains of India and in Ceylon, either as a planted tree or appearing spontaneously as an epiphyte on tombs or old buildings, and also on the stems of various kinds of trees, often entirely enveloping their stems and eventually killing them. The common wild Date-palm is very often attacked, but owing to the endogenous growth of their stems they are not usually destroyed. The Banyan tree is believed to be quite wild in the Sub-Himalayan forests and on the lower slopes of the Deccan Hills, also in damp valleys of Chota Nagpur. The foliage affords excellent fodder for cattle and elephants.

3. *F. tomentosa*, Roxb. ex Willd.; Hort. Beng. 103; Fl. Ind. iii, 550; Brandis For. Fl. 414; Ind. Trees 601; King Sp. Fic. 22, t. 18; F. B. I. V., 501; Gamble Man. 610; I rain Beng. Pl. 980; Cooke Fl. Bomb. ii, 646.

A large shade-giving tree, but often an epiphyte; bark smooth, greenish-white; aerial roots from the branches thin; young parts clothed with rusty-grey tomentum. *Leaves* crowded towards the ends of the branches, coriaceous, 2-5 in. long, elliptic-ovate or obovate, obtusely acuminate, entire; upper surface glabrous or nearly so, rusty-grey-tomentose beneath; base rounded or subcordate, 3-7-nerved; main lateral nerves above the basal ones about 5 pairs, prominent beneath; midrib with a broad smooth gland at the base; petiole  $\frac{3}{4}$ -1 in. long, tomentose; stipules  $\frac{1}{2}$ -1 in., densely woolly on the back. *Receptacles* in pairs, axillary, sessile, globose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., grey-tomentose; apical scales, small, glabrous; basal bracts 3, large,

spreading, pubescent, sometimes 3-fid. when young. MALE FLOWERS few, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. GALL FLOWERS : *Sep.* 4, shorter than the smooth ovary ; style short. FERTILE FLOWERS : *Sep.* as in the gall flowers ; style elongate. *Achenes* tuberculate.

Forests of Bundelkhand. The fruit ripens during the hot season. DISTRIB. : Southwards from Behar and Chota Nagpur through Central W. and S. India, also in the drier tracts of Ceylon. It is very destructive to buildings if allowed to encroach as an epiphyte. The fruit is much eaten by birds.

**4 F. retusa,** Linn. *Mantiss.* 129 ; *Brandis For. Fl.* 417 ; *Ind. Trees* 603 ; *King Sp. Ficus* 50, t. 61 and t. 84 ; *F. B. I. V.*, 511 ; *Watt E. D.* ; *Gamble Man.* 643 ; *Prain Beng. Pl.* 980 ; *Cooke Fl. Bomb.* ii, 647.—Vern *Nándan*.

A large or moderate-sized evergreen glabrous tree, often epiphytic ; aerial roots few ; bark dark-grey, smooth. Leaves coriaceous, shortly stalked, 2-3 in. long and nearly as broad, elliptic ovate or obovate, rounded or shortly and bluntly acuminate at the apex, polished and shining ; base narrowed into the petiole, 3-nerved ; main lateral nerves 5-6 pairs above the basal ones, not more prominent than the secondary ones, reticulately veined between ; petiole  $\frac{1}{2}$ - $\frac{1}{2}$  in., stipules lanceolate,  $\frac{2}{5}$  in. Receptacles about  $\frac{1}{2}$  in. in diam., sessile in pairs, axillary or from the scars of fallen leaves, depressed-globose, smooth, yellow or reddish when ripe ; basal bracts 3, spreading broadly ovate, blunt, persistent. MALE FLOWERS many, scattered, sessile or shortly stalked. *Sepals* 3, subspathulate. *Stamen* 1, filament as long as the cordate apiculate anther. GALL FLOWERS sessile or nearly so. *Sepals* 3, oblong or broadly spatulate. Style short. FERTILE FLOWERS usually sessile. *Sepals* 3, much shorter than those of the gall flowers. Style short ; stigma cylindric or clavate. *Achenes* ovoid or obovoid.

Bundelkhand (Edgeworth, Duthie), often on rocks. DISTRIB. : Chota Nagpur and Behar and from Cent. W. and S. India to Ceylon ; also in the Sundarbans and in the Andaman and Malay Islands, extending to Australia. This tree, when cultivated, affords an abundance of cool shade and might be used more generally than it now is as a roadside tree and in the formation of groves. Gamble states that the wood is moderately hard and might be used for making furniture. The small figs, are much eaten by pigeons.

VAR. *nitida*, *King Sp. Ficus* 51, tt. 62 and 84 fig. P. ; *F. B. I. V.*, 511 ; *Kanjilal For. Fl.* (ed. 2), 370 ; *Prain Beng. Pl.* 980. *F. nitida*, *Thunb.*

*Fig. 14.* *F. Benjamina*, Willd.; Roxb. Fl. Ind. iii, 550.—Vern. *Kamrup*.—Leaves 2-5 in. long, ovate or rhomboid-elliptic; receptacles usually whitish.—Siwalik range at about 3,000 ft. (Kanjilal), and in the forests of N. Oudh (R. Thompson, Duthie).—Distrib.: Along the base of Himalaya from Kumaon eastwards; also in Bengal, Assam, Khasia Hills, extending to Burma and China. A very handsome evergreen tree and suitable for planting in gardens if sufficient space be allowed for the development of aerial roots from the lower branches.

**5. *F. glaberrima*.** Blume Bijdr. 451; King Sp. Fic. 37, t. 43; F. B. I. V., 506; Kanjilal For. Fl. (ed. 2), 370; Gamble Man. 640; Prain Beng. Pl. 980; Brandis Ind. Trees 600. *F. angustifolia*, Roxb. Fl. Ind. iii, 554.—Vern. *Kakri*, *durla* (fide Brandis).

A tall tree, glabrous except the branchlets and lower surface of leaves; bark light yellowish-brown, lenticellate. Leaves subcoriaceous, 5-8 in. long, elliptic oblong or ovate-lanceolate, bluntly acuminate, entire, glabrous and shining above, puberulous beneath; base acute, rarely rounded, 3-nerved; lateral nerves 8-10 pairs, nearly horizontal, not very prominent; petiole  $\frac{2}{3}$ -1 $\frac{1}{2}$  in., slender; stipules  $\frac{1}{2}$ -in. linear-lanceolate, glabrous, fugacious. Receptacles stalked, in axillary pairs,  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam., smooth and orange-coloured when ripe; basal bracts 3. MALE FLOWERS, a few near the mouth of the receptacle, sub sessile. Sepals 4, lanceolate. Stamen 1; filament short. GALL FLOWERS sessile or nearly so. Perianth 4-fid. FERTILE FLOWERS: Perianth none. Achenes viscid when ripe.

Swampy ground in Dehra Dun (Duthie), and in the Sub-Himalayan tract eastwards. Receptacles ripen in Feb.-March. DISTRIBUT.: Tropical Himalaya, in shady ravines from Garhwal and Kumaon to Bhutan; also in Burma, the Andamans and the Malay Islands. The leaves and young shoots afford excellent fodder.

**6. *F. religiosa*.** Linn. Sp. Pl. 1959; Roxb. Fl. Ind. iii, 547; Royle Ill. 337; Brand. For. Fl. 415; Ind. Trees 601; King Sp. Fic. 55, t. 67A; F. B. I. V., 513; Watt E. D.; Comm. Ind. 538; Kanjilal For. Fl. (ed. 2), 371; Gamble Man. 644; Collett Fl. Siml. 459; Prain Beng. Pl. 980; Cooke Fl. Bomb. ii, 649.—Vern. *Pipal*, *pipli* (Hind).

A large glabrous tree usually at first epiphytic; bark grey, exfoliating in roundish irregular flakes; branches without aerial roots. Leaves coriaceous, shining, long-petioled, drooping, 4-7 in. long, ovate-

rotund, entire, narrowed upwards and with the apex produced into a linear-lanceolate tail  $\frac{1}{2}$  the whole length of the blade; base broad, rounded or truncate, or sometimes in young leaves cordate; 5-7 nerved; main lateral nerves about 8 pairs, with fine reticulations between; petioles 3-4 in. long, slender, terete; stipules minute, ovate, acute. *Receptacles* in pairs, axillary, sessile, smooth, depressed-globose,  $\frac{1}{2}$  in. in diam., dark-purple when ripe; basal bracts 3, broad, spreading, coriaceous. *MALE FLOWERS* few, only near the mouth of some receptacles, absent in others, sessile. *Sepals* 3, broadly ovate. *Stamen* 1, filament short. *Gall and fertile flowers* sessile or pedicelled, the gall flowers predominating, many without a perianth. *Sepals* 5, lanceolate. *Style* short, lateral, stigma rounded.

Very common within the area, but chiefly planted in villages and in the vicinity of Hindu temples. Probably wild on the Siwalik range and in the forests of the Sub-Himalayan tracts. The tree is leafless for a few weeks only, the new foliage appearing in Feb., and the receptacles ripen during April and May. *DISTRIB.*: Sub-Himalayan forests from the Punjab eastwards, also in Bengal, Orissa, the Circars and Central India. In other parts of India it has been planted or has run wild. On the Himalaya it occurs as a planted tree up to 5,000 ft. In Ceylon and Burma it was introduced by Buddhists, by whom and by all Hindus the tree is held very sacred. On this account it is often very difficult to insist upon the removal of the trees from the forests where they do very much damage as epiphytes. Buildings are also liable to serious injury by the growth of seedling plants. The trees are much lopped, chiefly by Muhammadans, in order to obtain fodder for their cattle, elephants and camels. The greyish wood is moderately hard and is sometimes used for making packing-cases or burnt for charcoal. The leaves, bark and fruit are used medicinally.

**7. F. Rumphii**, Blume *Bijdr.* 437; King *Sp. Fic.* 54, t. 67B.; *F. B. I. v.*, 512; Watt *E. D.*; Kanjilal *For. Fl.* (ed. 2), 371; Gamble *Man.* 644; Collett *Fl. Siml.* 459; Prain *Beng. Pl.* 980; Cooke *Fl. Bomb.* ii, 648; Brandis *Ind. Trees* 601 and 717. *F. cordifolia*, Roxb. *Fl. Ind.* iii, 548 (not of Blume); Brandis *For. Fl.* 416, t. 48.—*Vern.* *Khabar gajjun*, (Hind.), *pilkhan* (Punj.), *ganiper* (Oudh), *parás-pipal* (Merwára).

A moderate-sized deciduous tree, usually epiphytic in early life; all parts glabrous; bark yellowish-grey, smooth. *Leaves* subcoriaceous, glabrous and shining, 3-6 in. long, broadly ovate and with an

acuminate apex forming about  $\frac{1}{3}$  of the blade; margins entire, subundulate; base broad, truncate, slightly narrowed towards the petiole, rarely subcordate, usually 5-nerved; main lateral nerves 3-6 pairs, prominent only in the young leaves; petiole  $2\frac{1}{2}$ -3 $\frac{1}{2}$  in., flattened or channelled above; stipules  $\frac{1}{2}$ -1 in., ovate-lanceolate. *Receptacles* sessile in pairs, axillary and from the old leaf scars,  $\frac{1}{2}$  in. in diam., globular and not depressed at the apex, smooth and whitish and with dark spots when young, nearly black when ripe; basal bracts 3, small, rotund. **MALE FLOWERS** few, only near the mouth of the receptacle. *Sepals* 3, spatulate. *Stamen* 1, filament about as long as the anther. *Ovary* of gall flower smooth, usually obovoid. *Achene* minutely tubercled, mucilaginous; style elongate, stigma clavate.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Him. forest tracts of Rohilkhand N. Oudh and Gorakhpur, also in Bundelkhand and Merwára. Often planted in avenues, but a destructive epiphyte in forests. The young leaves, which are red, appear in March, and the receptacles ripen during May and June. **DISTRIB.** : Outer Himalayan ranges from the Chenab, ascending to 5,000 ft. ; also in Assam Bengal and southwards through Central W. and S. India, extending to Burma and the Malay Peninsula and Islands. The fruit is eaten, and the foliage is much used as fodder for cattle and elephants. The soft spongy wood is pinkish-white. The tree is closely allied to *F. religiosa* which it much resembles.

**S. F. Arnottiana**, *Miq. Ann. Mus. Lugd. Bat.* iii, 287; *King Sp. Ficus* 56, t. 68 and t. 84; *F. B. I. v.*, 513; *Kanjilal For. Fl. (ed. 2)*, 371; *Gamble Man.* 638; *Prain Beng. Pl.* 980; *Cooke Fl. Bomb. ii*, 649; *Brandis Ind. Trees* 602.

A small glabrous tree or a shrub, often epiphytic. *Leaves* subcoriaceous, 3-8 in. long, broadly ovate, narrowed upwards to the shortly caudate-acuminate apex, margins entire; base usually cordate, never narrowed into the petiole, 7-nerved; main lateral nerves 5-7 pairs with fine lucid reticulations between; petioles 2-6 in. long; stipules ovate-lanceolate,  $\frac{1}{2}$ -1 in. long, caducous, reddish-brown when dried. *Receptacles* mostly from the axils of fallen leaves, in pairs or clusters from tubercles, sessile or shortly stalked, depressed-globose, smooth,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., purple with greenish dots when ripe; basal bracts 3, brown, membranous. **MALE FLOWERS** few, near the mouth of the receptacles, sessile. *Sepals* 3, loose, inflated, broadly acuminate, larger than the small subsessile solitary anther. **GALL AND FERTILE FLOWERS** undistinguishable except by the contents of the ovary,

sessile or pedicelled. *Perianth* gamophyllous, lax, toothed at the apex, completely investing the ovary. *Style* elongate, stigma flat.

Rajputana, in the neighbourhood of Ajmer, on rocky ground (Brandis).  
DISTRIB. : Outer ranges of W. Himalaya in Jaunsar Garhwal and Kumaon, up to 3,000 ft., and from Chota Nagpur through Central W. and S. India to Ceylon. The leaves resemble those of *F. Rumphii*, but they are never narrowed at the base into the petiole.

9. *F. infectoria*, Roxb. *Fl. Ind.* iii, 551 (excl. syn. *Rheede*) (not of Willd.) ; Brandis *For. Fl.* 414 (excl. syn.) ; *Ind. Trees* 602 ; King *Sp. Fic.* 60, t. 75 ; *F. B. I.* v, 515 ; Watt *E. D.* ; *Comm. Prod. Ind.* 538 ; Kanjilal *For. Fl.* (ed. 2), 372 ; *Gamble Man.* 645 ; *Prain Beng. Pl.* 981 ; *Cooke Fl. Bomb.* ii, 651. *F. Lacor*, *Buch.-Ham. in Trans. Linn. Soc.* XV, 150.—Vern. *Khabar*, *pákhár*, *pílkhan*.

A large spreading deciduous fast-growing glabrous tree, often epiphytic in early life and sometimes sending down a few aerial roots from the trunk or branches ; bark greenish-grey, smooth. *Leaves* membranous,  $3\frac{1}{2}$ -5 in. long, ovate or ovate-oblong, shortly and rather abruptly acuminate ; margins entire, subundulate ; base usually rounded, slightly cordate or sometimes narrowed or acute, 3-nerved, main lateral nerves 5-7 pairs, not very prominent ; petioles  $1\frac{1}{2}$ - $2\frac{1}{4}$  in., sometimes indistinctly jointed with the blade ; stipules about  $\frac{1}{2}$  in., long, broadly ovate, acute, pubescent. *Receptacles* axillary, in pairs sessile, globose,  $\frac{1}{2}$  in. in diam., whitish flushed with red and dotted when ripe ; basal bracts 3 minute, ovate-rotund. MALE FLOWERS few, sessile near the mouth of the receptacles. *Sepals* 4 or 5. *Stamen* 1 ; anther broadly ovate filament short. *Perianth* of gall and fertile flowers as in the male. *Style* of gall flowers short ; of the fertile female flowers long, stigma elongate.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. It is not common anywhere wild, but is occasionally met with near villages as a planted tree. DISTRIB. : Throughout India, extending from the outer Himalayan ranges to Ceylon, Burma, Malay Peninsula and China. The wood is used chiefly for making charcoal, and the young shoots are eaten in curries. The bark yields a fairly good fibre, and the tree is much lopped to supply fodder for cattle and elephants.

VAR. I. *Lambertiana*, King *Sp. Fic.* 63, t. 76 ; *F. B. I. V.*, 516 ; Kanjilal *For. Fl.* (ed. 2) 373 ; *Prain Beng. Pl.* 981 ; *Cooke Fl. Bomb.* ii, 651. *F. Lambertiana*, Miq.—Leaves coriaceous ; base broad, rounded

emarginate or subcordate; receptacles stalked.—Dehra Dun and Siwalik range. DISTRIB.: W. C. and S. India.

VAR. 2. *Wightiana*, King. Sp. *Ficus l. c.*; F. B. I. V., 516; *F. Wightiana* Wall.—Leaves smaller, often under  $2\frac{1}{2}$  in. long, narrowed to the base; receptacles stalked,  $\frac{1}{2}$  in. long, large in proportion to the size of leaves, pubescent.—Southern edge of gangetic Plain. DISTRIB.: W. and S. India.

10. *F. heterophylla*, Linn. f. *Suppl.* 442; Roxb. *Fl. Ind.* iii, 532; Brandis *For. Fl.* 424; *Ind. Trees* 606; King Sp. *Ficus* 75, t. 94; F. B. I. v, 518; Watt E. D.; Kanjilal *For. Fl.* (ed. 2) 373; Gamble *Man.* 646; Prain *Beng. Pl.* 981; Cooke *Fl. Bomb.* ii, 652. *F. repens*, Willd.; Roxb. *Fl. Ind.* iii, 535; Brandis *For. Fl. l.c.*

A shrub, often creeping along the ground or over rocks; branchlets pubescent. Leaves alternate, polymorphous, petioled, membranous, 2-5 in. long, ovate or orbicular-ovate to lanceolate, more or less acuminate, entire or 3-many-lobed, scabrous on both surfaces; margins coarsely toothed or repand-dentate; base rounded or cordate, 3-5-nerved; main lateral nerves 4-8 pairs, arched, or in much-lobed leaves palmate; petioles  $\frac{1}{2}$ -2 in.; stipules 2 to each leaf,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, ovate, scarious. Receptacles stalked, solitary, axillary, globose to pyriform, more or less hispid, scabrid or warty when young, nearly smooth and orange-yellow when ripe, always with a more or less prominent mammilæ partially open umbilicus; peduncle  $\frac{1}{2}$ -1 in. long; basal bracts minute, triangular glabrous. Perianth of all the flowers 3-4-cleft. MALE FLOWERS: Stamen 1. GALL FLOWERS: Ovary ovoid, smooth; style short, lateral. FERTILE FLOWERS: Perianth hyaline, viscid, tubercled. Achenes subglobose; style long, lateral, stigma cylindric.

Banks of rivers and wet places in Dehra Dun, and eastwards along the Sub-Himalayan tracts to Gorakhpur, also in Bundelkhand, etc. DISTRIB.: Throughout the hotter parts of India and in Ceylon, extending to the Malay Peninsula and Islands.

The rough rust-coloured bark is used medicinally, and the fruit is said to be eaten. King mentions *F. scabrella* Roxb. and *F. repens* Willd. as representing the two most prevalent forms of this polymorphous shrub. In the former the leaves are shortly petioled, narrow and never lobed, and the receptacles are shortly pedicelled, globular or pyriform. The latter has broader leaves, lobed or not and with petioles over 1 in. long, and the pedicels of the pyriform receptacles

are much longer.—Examples of both of the above-mentioned forms are found within the Upper Gangetic area.

11. *F. hispida*, Linn. *f. Suppl.* 442; *Brandis For. Fl.* 423; *Ind. Trees* 606; *King Sp. Fic.* 116, *tt.* 154 and 155; *F. B. I. v.* 522; *Watt E. D.*; *Kanjilal For. Fl.* (*ed.* 2), 374; *Gamble Man.* 647; *Collett Fl. Siml.* 460; *Prain Beng. Pl.* 981; *Cooke Fl. Bomb. ii.*, 653. *F. oppositifolia*, *Willd.*; *Roxb. Fl. Ind. iii.*, 561. *F. dæmonum*, *Kæn.*; *Roxb. I.c.* 562 (*dæmonia*).—Vern. *Kagsha*, *gobla* (Hind.), *kákṣa*, *Gogsba*, *gobha* (Dehra Dun), *kat gularia* (Oudh).

A shrub or small tree; all parts more or less hispid-pubescent; bark grey, peeling off in irregular flakes; young shoots hollow. *Leaves* usually opposite, petioled, membranous, 4-12 in. long, ovate oblong or subovate, apiculate or shortly and abruptly acuminate, toothed or entire, the lower surface hispid-pubescent, the upper hispid-scabrid; base rounded, subcordate or subcuneate, 3-5-nerved; main lateral nerves 3-5 pairs, finely reticulate between; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. or those of young shoots longer, densely hispid; stipules 2 to each leaf, ovate-lanceolate, pubescent outside, about  $\frac{1}{2}$  in. long. *Receptacles*  $\frac{1}{2}$ -1 in. across, turbinate ovoid or subpyriform, hispid and often with scattered bracts along the sides, yellowish when ripe; peduncles  $\frac{1}{2}$ -1 in. long, in axillary pairs, or in fascicles from shortened tuberculate branches from the old wood, or on elongate leafy branches issuing from the stem or larger branches and often reaching and even penetrating the soil; basal bracts 3. *MALE FLOWERS* many, near the apex of the receptacles containing galls. *Sepals* 3, concave, hyaline. *Stamen* 1, filament short. *GALL FLOWERS* stalked. *Perianth* none. *Ovary* globose, smooth; style short, subterminal, stigma dilated. *FERTILE FLOWERS*: *Perianth* none or obscure. *Achenes* ovoid; style lateral; stigma cylindric, tubular.

Fairly common in the forests of Dehra Dun and Saharanpur and eastwards to N. Oudh, also in Bundelkhand and in other parts of the area. The new foliage appears in Feb. and March. *DISTRIB.*: Outer Himalayan ranges from the Chenab eastwards, ascending to 3,500 ft.; also in Bengal and from C. W. and S. India to Ceylon; extending to Burma, the Andamans and from the Malay Peninsula and Islands, extending to China and Australia. This tree is reproduced partly by root-suckers. The foliage affords fodder for cattle, and the young receptacles are eaten in curries. The bark supplies a fibre suitable for making ropes.

12. *F. laminosa*, Hardw. in *As. Res.* vi, 379; ex Roxb. *Hort.* *Beng.* 103; *Fl. Ind.* iii, 531; Madden in *Journ. As. Soc. Beng.* xvii, part 1, 643; *Prain Beng. Pl.* 982. *F. semocarpa*, Miq.; King *Sp. Fic.* 116, t. 152; *F. B. I.* v, 523; *Kanjilál For. Fl.* (ed. 2), 374; *Gamble Man.* 647; *Brandis Ind. Trees* 606 and 718. *F. squamosa*, Roxb. *Fl. Ind.* iii, 531. *F. tuberculata*, Wall. (not of Roxb.); *Brandis For. Fl.* 424 and 577. *F. pyrrhocarpa*, Kurz.—Vern. *Chancheri* (Garhwal), *gur-timla* (Kumaon).

A low shrub; branchlets hirsute. Leaves opposite, crowded at the ends of the branches, 3-9 in. long, linear-lanceolate or oblanceolate, entire, smooth, rarely scabrid on upper surface, smooth or scaberulous and rarely hispid beneath; base narrowed, 3-nerved; main lateral nerves 6-8 pairs; petioles  $\frac{1}{2}$ -1 in. long, pubescent; stipules in pairs  $\frac{1}{2}$ - $\frac{1}{2}$  in., ovate, acuminate, nearly glabrous, persistent. *Receptacles* shortly stalked, solitary in the axils, or in short leafless panicles from the old wood, subglobose,  $\frac{1}{2}$ -1 in. in diam.; base constricted, 8-10-ribbed, warted and hispid and with scattered bracts on the sides; umbilicus large; peduncles  $\frac{1}{2}$ - $\frac{1}{2}$  in., pubescent; basal bracts 3, triangular, deciduous. MALE-flowers: *Stamen* 1. *Perianth* of fem. flowers none or obscure. *Ovary* of gall flowers smooth; style short, lateral. *Achenes* rhomboid, style very long, hairy.

Dehra Dun and eastwards along the Sub-Himalayan tracts, usually by shady streams and often in the crevices of partially submerged rocks. The receptacles ripen during the cold season. DISTRIB.: Outer Himalaya from the Jumna to Bhutan, in sandy and rocky streams, also in Assam, the Khasia Hills and Burma. Closely allied to *F. hispida*, of which it may, as suggested by King, be a much modified form brought about by the peculiar conditions of its habitat. There is a coloured drawing of this shrub (plate 65) in Hardwicke's unpublished collection of drawings of Indian plants, a copy of which will be found in the botanical library at the Natural Hist. Museum. Colonel Hardwicke mentions that the villagers in Garhwal feed their cows on the branches and leaves of this shrub.

13. *F. Cunia*, Buch.-Ham. ex Roxb. *Fl. Ind.* iii, 561; *Brandis For. Fl.* 421; *Ind. Trees* 606; King *Sp. Fic.* 101, t. 126; *F. B. I.* v, 523; Watt *E. D.*; *Comm. Prod. Ind.* 538; *Kanjilál For. Fl.* (ed. 2), 375; *Gamble Man.* 648; *Prain Beng. Pl.* 982; *Collett Fl. Siml.* 460. *F. conglomerata*, Roxb. *Fl. Ind.* iii, 559.—Vern. *Jarhphali* (Hind.), *khain*, *kheina* (Dehra Dun), *khenna* (Bijnor), *khurhur* (Oudh).

A low tree with reddish-brown rough bark; branchlets scabrous. Leaves alternate, 6-12 in. long, elliptic to oblong-lanceolate, very unequal-sided, acuminate, entire or serrate, scabrid or smooth on upper surface, more or less pubescent beneath; base semisagittate, the larger basal lobe 3-4-nerved, the smaller 1-nerved; main lateral nerves 9-14; petioles  $\frac{1}{2}$ - $\frac{2}{3}$  in., scabrid; stipules  $\frac{1}{2}$ -1 in., linear-lanceolate, puberulous. Receptacles  $\frac{1}{2}$  in. in diam., globose or pyriform, in pairs or clusters on scaly usually leafless branches, hispid, reddish-brown and ribbed when ripe; peduncle short; basal bracts 3. Male sepals 3. Gall and fem. sepals about 4, lanceolate, gamophylous. Ovary of gall flowers globose, smooth; style very short, lateral. Achenes broadly ovoid, emarginate on one side, tubercled, viscid; style very long, lateral; stigma large, bifid.

Forests of Dehra Dun and Saharanpur, common on the Siwalik range and extending eastwards along the Sub-Himalayan tract to N. Oudh. Usually found in ravines or on the banks of streams. The receptacles ripen mostly during Aug. and Sep. DISTRIB.: Outer Himalayan ranges from the Chenab eastwards to Bhutan, ascending to 4,000 ft.; also in Assam, the Khasia Hills, Chittagong, Bengal and C. India. The fruit is often eaten, but is rather insipid; the bark yields a strong fibre, and the leaves are said to be used for polishing wood.

**14. F. scandens**, Roxb. Hort. Beng. 65; Fl. Ind. iii, 536; Brandis For. Fl. 421; Ind. Trees 609; King Sp. Ficus 129, t. 162; F. B. I. v, 526; Watt E. D.; Kanjilal For. Fl. (ed. 2), 375; Gamble Man. 648; Prain Beng. Pl. 982; Cooke Fl. Bomb. ii, 654. F. fruticosa, Roxb. Fl. Ind. iii, 533; F. hederacea, Roxb. l.c. 538.—Vern. Chhanchri (Dehra Dun).

A scandent or creeping shrub, often rooting from the stem and branches. Leaves 2-3½ in. long, ovate or elliptic-ovate, acute or subacute, entire, rugulose and scabrid above, sub-areolar beneath; base broad, rounded, strongly 3-nerved; main lateral nerves 3 pairs; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in.; stipules  $\frac{1}{2}$  in., ovate, acuminate. Receptacles axillary, long-peduncled, solitary or in pairs,  $\frac{1}{2}$  in. in diam., globose, scaberulous, yellow turning to red when ripe; base sometimes constricted into a stipe; peduncle 3-5 in. long. Sepals of all flowers 4. Male flowers usually diandrous, anthers subsessile. Ovary of gall flowers obovoid, smooth; style subterminal, short, thick, stigma hooked. Achenes oblong, smooth; style lateral, long; stigma subcapitate.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract, usually in damp places, often climbing and trailing on rocks or

on trees. The receptacles ripen during the rainy season. DISTRIB. : Valleys of Outer Himalaya from the Sutlej eastwards to Bhutan ; also Assam, Khasia Hills, Chittagong, Chota Nagpur, Burma, and Andaman Islands.

15. *F. foveolata*, Wall. Cat. 4493 ; Brandis For. Fl. 423 ; Ind. Trees 608 ; King Sp. Ficus 133, t. 166 ; F. B. I. v. 528 ; Watt E. D. ; Kanjilál For. Fl. (ed. 2), 375 ; Gamble Man. 648 ; Collett Fl. Siml. 460 ; Prain Beng. Pl. 982 ; F. pubigera, Wall. ; Brandis For. Fl. 424.

A creeper or a lofty climbing shrub. Shoots pubescent. Leaves of climbing stems membranous,  $1\frac{1}{2}$ -6 in., ovate oblong or lanceolate, acute or acuminate, entire, glabrous above, pubescent or glabrate beneath and with prominent nerves ; base rounded cordate or subcuneate, 3-nerved ; main lateral nerves 3-6 pairs ; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in., pubescent ; stipules in pairs,  $\frac{1}{2}$  in., villous. Receptacles axillary, sessile, usually solitary, subglobose to ovoid or obovoid,  $\frac{1}{2}$ -1 in. long, warted or wrinkled, downy, red or orange-coloured when ripe ; basal bracts 3, ovate, acute, often reflexed ; peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  in. MALE FLOWERS stalked. Stamens 2, rarely 3 ; filaments connate ; anthers ovate, pointed. Sepals of all flowers 4. Ovary of gall flowers obovoid ; style short, stigma dilated. Achene oblong-reniform, papillose ; style long, subterminal.

Dehra Dun, near the Robbers' Cave. DISTRIB. : Outer Himalayan ranges from Chamba (Punjab) to Bhutan ; also Chitral, Khasia Hills, Chittagong and Burma, extending to Hongkong, China and Japan. Collett remarks that the receptacles are rarely, if ever, produced on the creeping branches.

16. *F. palmata*, Forsk. Fl. Ægypt.-Arab. 179 ; King Sp. Fic. 146, t. 185 ; F. B. I. v. 530 ; Watt E. D. ; Kanjilál For. Fl. (ed. 2), 376 ; Gamble Man. 649 ; Collett Fl. Siml. 460, f. 148 ; Brandis Ind. Trees 607, 718. *F. caricooides* Roxb. Fl. Ind. iii, 529. *F. virgata*, Roxb. l.c. 530 ; Royle Ill. 337 ; Brandis For. Fl. 419.—Vern. *Anjiri*, *bedu*, *khemri* (Dehra Dun), *kembu* (Merwara).

A bush or small tree, never an epiphyte ; bark smooth, dull ashy grey ; young shoots usually tomentose or pubescent. Leaves membranous  $1\frac{1}{2}$ -5 in. long, orbicular-ovate, acute or apiculate, dentate or serrate or entire or obtusely 3-5-lobed, somewhat scabrous above, scabrid or shortly tomentose beneath ; base 3-nerved ; main lateral nerves 3-6 pairs ; petiole 1-2 in., stipules in pairs, ovate, acute, pubes-

cent, deciduous. *Receptacles* axillary, solitary,  $\frac{1}{2}$ -1 in. in diam., sub-globose or pyriform, pubescent, yellow when ripe; base constricted; bracts acute, deciduous; peduncle  $\frac{1}{2}$ -1 in. MALE FLOWERS on hairy pedicels. *Sepals* 4-5, lanceolate, hairy. GALL FLOWERS sessile or stalked. *Perianth* deeply 5-fid. *Ovary* ovoid, smooth; style very short, lateral, stigma dilated. *Perianth* of fem. flowers as in galls. *Achenes* trigonous, granular; style subterminal, long, hairy, stigma bifid.

Dehra Dun, and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Merwára. The new foliage is renewed during March and April and the figs ripen from June to Oct. DISTRIB. : Central and N. W. India, Outer Himalaya from Nepal westwards, ascending to 5,000 ft., and from the Suliman and Salt ranges to Chitral, Egypt and Abyssinia. This species much resembles the European fig (*F. carica*), and is generally regarded as its Indian representative. It is often cultivated in N. W. India, but chiefly on the hills where the fruit produced is of better quality. The leaves are much used as cattle fodder.

17. *F. Roxburghii*, Wall. *Cat.* 4508; *Brandis For. Fl.* 422; *Ind. Trees* 609; *King Sp. Ficus* 168, t. 211 and frontispiece; *F. B. I. v.* 534; *Watt E. D.*; *Kanjilál For. Fl.* (ed. 2), 377; *Gamble Man.* 649; *Collett Fl. Siml.* 461; *1 rain Beng. Pl.* 983. *F. macrophylla*, *Roxb. Fl. Ind. iii*, 556 (not of *Desf.*).—Vern. *Trimmal*, *timla*.

A low spreading tree 10-30 ft. high; trunk short, bark grey or brown, warty; branchlets few, stout, hollow. Leaves 5-15 in. long, broadly ovate or rounded; margins entire or toothed, mucronate, glabrous or glabrescent above, softly pubescent beneath; base usually deeply cordate, strongly 5-7-nerved; main lateral nerves 3-6 pairs, prominent on both surfaces, nervules nearly transverse; petioles 1-4 in.; stipules  $\frac{1}{2}$ -1 in., ovate-lanceolate, pubescent. *Receptacles* 8-12-ribbed, turbinate, in clusters on short leafless branchlets from low down on the trunk,  $2\frac{1}{2}$  in. across or larger, pubescent or glabrous, russet-brown or purplish and spotted when ripe; umbilicus large, triangular; peduncle pubescent,  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long. MALE flowers: *Sepals* large, inflated, broadly imbricate. *Stamens* 2, rarely 3; filaments long, stout. GALL flowers: *Perianth* 2-3-lobed. *Style* short, subterminal, stigma dilated. FEM. flowers subsessile or stalked. *Perianth* as in gall flowers. *Achenes* granulate, viscid; style long, lateral, curved, hairy, stigma cylindric.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract. The receptacles ripen April to June. DISTRIB.: Outer Himalayan ranges from the Indus to Bhutan, up to 5,000 ft., rarer towards the west, also Assam, Khasia Hills, Chittagong, Chota Nagpur and Orissa, extending to Burma, China and Japan. The bark yields a coarse fibre, and the foliage is regarded as a good fodder for elephants and camels. The fruit is much eaten either raw or cooked in curries. For information regarding the development and fertilization of the flowers see J. D. Cunningham in Appendix to Vol. I of Ann. R. Bot. Gard. Calc.

18. *F. glomerata*, Roxb. Cor. Pl. ii, 13, t. 123; Fl. Ind. iii, 558; Royle Ill. 337; Brandis For. Fl. 422, t. 49; Ind. Trees 609; King Sp. Ficus 173, t. 218A; F. B. I. v, 535; Watt E. D.; Comm. Prod. Ind. 533; Kanjilal For. Fl. (ed. 2), 378; Gamble Man. 650; Prain Beng. Pl. 983; Cooke Fl. Bomb. ii, 654. F. Goolereea, Roxb. Fl. Ind. iii, 538.—Vern. Gular (Hind.), umri (Merwara).

A tree, up to 60 ft. high; bark smooth, reddish-brown; young shoots glabrous pubescent or scabrous. Leaves membranous, 4-7 in. long, ovate-oblong or elliptic-lanceolate, subacute, entire, glabrous or upper surfaces when mature, usually somewhat pubescent beneath; base rounded or acute, 3-nerved; main lateral nerves 4-6 pairs; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in., glabrous; stipules  $\frac{1}{2}$ -1 in. long; ovate-lanceolate, scarious, pubescent. Receptacles in clusters on short thick scaly leafless paniced branchlets from the trunk and larger branches, rarely with a few axillary ones, subglobose pyriform or turbinate, smooth or downy, 1-2 in. across, reddish or orange-coloured when ripe; umbilicus depressed; base much contracted and with 3 ovate-triangular bracts. The male, female and gall flowers are all found together in the same receptacle. MALE FLOWERS near the mouth of the receptacle, sessile. Sepals 3-4, membranous, inflated, enveloping the 2 anthers. Filaments connate. GALL FLOWERS stalked. Perianth gamophyllous, irregularly toothed. Style lateral, elongate, stigma clavate. FERTILE FLOWERS nearly sessile, forming a layer near the walls of the receptacle. Perianth gamophyllous, with 4 or 5 long lanceolate teeth, enveloping the small tuberculate achene. Style subterminal, stigma clavate.

A common tree within the area and also largely planted in villages. It is leafless during the rainy season (about Aug.), and the figs ripen between April and July. DISTRIB.: Throughout the greater part of India from the Outer Himalayan ranges and south to S. India and Ceylon, its western limit being Rájputana and the Salt Range of

the Punjab. The fruit is much eaten by the natives, both raw and cooked, and it constitutes a valuable food supply during times of famine. The viscid milky juice is made into birdlime. The foliage is much lopped for supplying fodder for cattle and elephants, and the leaves, bark and fruit are used in native medicine. Kanjilál mentions that the wood of this tree is one of the few kinds prescribed in Hindu scriptures for sacrificial fires. It is said to last well under water.

The following non-indigenous species of *Ficus* are occasionally met with in gardens within the area of this flora :—

F. BENJAMINA, *L.* var. *COMOSA* Kurz ; *F. B. I.* v, 508 ; *Prain Beng. Pl.* 979 ; *Brandis Ind. Trees* 604 ; *Gamble Man.* 641. *F. comosa*, Roxb. *Fl. Ind.* iii, 552.—A very ornamental tree with the habit of *F. retusa*, and producing from its lower branches similar aerial roots. The receptacles are yellow and much larger than those of the type. It is wild in Chota Nagpur and in the Circars and in the valleys of the E. Himalaya ; also in Assam, Chittagong and throughout Burma.

F. ELASTICA, Roxb. ; *Fl. Ind.* iii, 541 ; *Brand. For. Fl.* 417 ; *Ind. Trees* 603 ; *F. B. I.* v, 508 ; *Kanjilál For. Fl.* (ed. 2), 369 ; *Cooke Fl. Bomb. ii*, 655 ; *Gamble Man.* 641.—The well-known india-rubber, or caoutchouc-tree, a native of the Eastern Himalaya up to 3,000 ft.; also in Assam, the Khasia Hills and extending to Upper Burma. It is grown in many parts of India as an ornamental tree in gardens, as well as for avenues. For full particulars regarding its cultivation for rubber see Watt's *Comm. Prod. Ind.*, p. 651.

F. TSIELA, Roxb. *Fl. Ind.* iii, 549 ; *Brandis For. Fl.* 415 ; *Ind. Trees* 603 ; *King Sp. Ficus* 59, ii. 73, 74 ; *F. B. I.* v, 15 ; *Gamble Man.* 645 ; *Cooke Fl. Bomb. ii*, 650.—A large spreading glabrous tree, without aerial roots ; allied to *F. infectoria*. It is found in the Ajmer district of Rájputana as a planted tree, but it is truly wild in the drier parts of S. India and in Ceylon. The smooth greenish-white bark is said to yield a good fibre.

F. CARICA, Linn. ; *Brandis For. Fl.* 418 ; *Ind. Trees* 607 ; *DC. L'Orig. Pl. Cult.* 235 ; *Watt Comm. Prod. Ind.* 537.—Vern. *Anjir*, *kimri*—Edible fig of Europe. The European fig is extensively cultivated in the plains of N. India and up to 5,000 ft. on the Outer Himalayan ranges. It is also largely grown in Kashmir, Baluchistan and Afghanistan and many excellent varieties may be found in those countries. It is said to be truly indigenous in Syria and Palestine. In S. Europe it has become naturalized, and is quite hardy in England.

BROUSSONETIA PAPYRIFERA, Vent. ; Royle Ill. 340 ; Brandis For. Fl. 410 ; Ind. Trees 613 ; F. B. I. v. 490 ; Kanjilal For. Fl. (ed. 2) 366 ; Gamble Man. 633 ; Prain Beng. Pl. 967 ; Watt in Comm. Prod. Ind.—Paper Mulberry.—A small tree belonging to the mulberry tribe. Branchlets tomentose. Leaves membranous, 3-nerved, 3-8 in. long, obliquely ovate or oblong, acuminate, lobed (when young) and dentate, scabrid above, pubescent beneath ; petioles 2-3 in. long. Flowers dioecious. MALE spikes 2-3 in. long, cylindrical, stalked pubescent. FEM. flowers in compact long-stalked heads. Fruit fleshy, red shining.—Wild on the hills of Upper Burma and in Martaban ; extending to Siam, China, Japan and the Pacific Islands. The stems yield a fine fibre which is used for making paper in Japan, and in the South Sea Islands the natives prepare from it a cloth called *tapa* or *kapa*. Experiments undertaken within the area of this flora, both in Dehra Dun and at Saharanpur, clearly show that the climate of N. India is quite suitable for its cultivation. It has been suggested that it might possibly pay to grow this tree on a large scale in N. India if a paper factory were situated near enough, and if a constant supply of the fibre material of this and other fibre-yielding plants suitable for making paper were available.

## CI. CASUARINACEÆ.

CASUARINA, Forst. A single genus, containing 23 species, mostly Australian and a few in New Caledonia, one only extending to India. Several other species are in cultivation in India, especially on the Nilgiri Hills.

C. EQUSETIFOLIA, Forst. ; F. B. I. v. 598 ; Brandis For. Fl. 435 ; Ind. Trees 620 ; Gamble Man. 665 ; Prain Beng. Pl. 985 ; Cooke Fl. Bomb. ii, 660. C. muricata, Roxb. Fl. Ind. iii, 519 ; Royle Ill. 346.—A tall handsome straight-stemmed dioecious leafless tree. Branches terminating in long slender drooping deciduous 6-8 jointed branchlets, which perform the functions of leaves. The ribs of each joint terminate upwards in the teeth or scales \* of a membranous sheath alternating with the ribs of the next joint above. Male flowers monandrous, in terminal cylindric spikes, and the females are arranged in small cone-like clusters which become woody

\* Similar to the scale-leaves of *Equisetum*.

when ripe. This tree is indigenous on the sandy sea-coasts of Chittagong and Burma, also in the islands of the Indian Archipelago and in N. Australia, where it is known as the "Beefwood tree." It is cultivated largely all over India, and thrives well as far north as Saharanpur and Ambála. The wood is of a reddish colour and resembles in texture that of *Cedrela Toona*, but is very hard, and difficult to work. It is chiefly used for fuel. The tree is very useful in the reclamation of land near the sea and is much valued in the Madras and Bombay Presidencies for planting on sand-dunes along the coasts of Coromandel and N. Kanara.

### CII. CUPULIFERÆ.

Trees or shrubs. *Leaves* simple, alternate, pinni nerved, serrate or entire, rarely lobed; stipules free, usually caducous. *Flowers* minute, monœcious, males in erect or pendulous catkins or spikes, rarely capitate; females in spikes or heads or solitary, bracts sometimes forming an involucre. *MALE* flowers: *Sepals* 1-5, free connate or obsolete. *Stamens* 2-20, on a hairy receptacle or adnate to the base of the sepals. *FEM.* flowers: *Sepals* connate in a perianth adnate to the ovary or none, limb minute. *Ovary* 2-3, rarely 4-6-celled, styles or style-arms as many as the cells; ovules 1 or 2, collateral, pendulous, anatropous. *Fruit* a nut included within or in the axil of often greatly enlarged, sometimes involucrate bracts. *Seed* usually solitary by abortion, pendulous, albumen none; cotyledons plano-convex, sometimes rugose or ruminate, radicle superior.—Species about 400, chiefly in N. temperate regions.

### QUERCUS, Linn. ; Fl. Brit. Ind. v, 600.

Trees or shrubs, deciduous or evergreen. *Leaves* alternate, simple, pinni nerved, stipules fugacious. *Flowers* small, monœcious; males in pendulous or erect spikes, bracts small; females in erect spikes, rarely androgynous, bracts involucrate. *MALE* flowers: *Perianth* campanulate, 4-7-lobed or -partite. *Stamens* 6-12, filaments slender; anthers erect, ovate, the cells contiguous. *Pistillode* hairy or none. *FEM.* flowers: *Perianth* adnate to the ovary and enclosed within imbricate bracts; limb very minute, lobed or

toothed. *Staminodes* minute or none. *Ovary* after fecundation more or less perfectly 3-celled, rarely 4-5-celled; styles 3-5, short, ovules 2 in each cell. *Fruit*, an ovoid globose or depressed 1-celled nut, seated on or enclosed in and attached by its broad base or by its whole surface to an involucre of imbricating hard bracts. *Seeds* 1-2, testa membranous, cotyledons plano-convex, thick, fleshy, smooth, grooved, lobed or ruminant, radicle minute.—Species about 300, in temperate and tropical regions. There are no wild oaks in S. India or Ceylon, and the genus is absent from S. America, Trop. and S. Africa and Australia.

*Q. incana*, Roxb. *Hort. Beng.* 104; *Fl. Ind.* iii, 642; *Brandis For. Fl.* 482; *Ind. Trees* 626; *F. B. I. v.* 603; *Watt E. D.*; *Comm. Prod. Ind.* 911; *King in Ann. Bot. Gard.* ii, 26, t. 20; *Kanjilal For. Fl.* (ed. 2), 402; *Gamble Man.* 675; *Collett Fl. Siml.* 475.—*Vern. Bán, báñ* (N. W. Him.).—White or grey oak.

A medium-sized or large evergreen tree up to 80 ft. high; young shoots hoary or woolly. *Leaves* coriaceous, pinkish when young and woolly all over, 3-6 in. long, oblong or ovate-lanceolate, acuminate, mucronate-serrate, glabrous above, densely white-tomentose beneath; main lateral nerves 14-20 pairs, straight, parallel, prominent beneath. *Male* flowers softly pubescent, in slender drooping catkins 2-4 in. long. *Perianth* 4-5-lobed. *Anthers* glabrous. *Female* flowers axillary, sessile, usually in clusters of 2-5. *Styles* linear-clavate, spreading. *Cup* axillary, solitary or clustered,  $\frac{1}{2}$  in. in diam., embracing half the conico-ovoid nut when ripe. *Nut*  $\frac{1}{4}$ -1 in. long, white-tomentose when young, at length glabrous and brown.

Dehra Dun, in the Mothronwala swamp, at an elevation of 1,900 ft. A few specimens of this tree planted many years ago on a shady spot in the Government Garden at Saharanpur managed to survive the tropical heat during several summers. *DISTRIB.*: W. Himalaya from the Indus to Nepal at 2-8,000 ft. It also occurs in the neighbourhood of Chitral in the N. W. Frontier Province, as well as on the Punjab Salt range and on the Shan hills of Upper Burma. The tree is very common on the outer ranges of the W. Himalaya and is often gregarious. It is frequently associated with *Rhododendron arboreum*, *Pieris ovalifolia* (ayár) and occasionally with deodar. The wood is used as fuel and for making charcoal. The bark contains a large percentage of tannin, and the leaves are much used as cattle fodder.

*Q. SERRATA*, *Thunb.* A handsome deciduous oak of the Central and E. Himalaya. It has been planted in Dehra Dun where it thrives. The wood closely resembles that of the English oak, and is much valued. This tree is found also in China and Japan.

*CASTANEA VULGARIS*, *Lamk.*; *Brandis For. Fl.* 491; *Ind. Trees* 635; *DC. L'Orig. Pl. Cult.* 283; *Gamble Man.* 667. *C. vesca*, *Gertn.* *C. sativa*, *Mill.*—Sweet chestnut. Many attempts have been made to introduce this tree for cultivation on the outer ranges of the Himalaya. Gamble remarks that the most successful results have been obtained at comparatively low elevations (3-5,000 ft.) with a northern aspect, and where the rainfall is not excessive. Also a good sandy soil rather than a clayey one appears to suit the trees best. The plantations which were started many years ago in Dehra Dun have been fairly successful, but the nuts are smaller than those yielded by the European tree and are inferior in quality. It resembles more nearly the fruit of the tree as grown in Japan and N. America.

### CIIL. SALICACEÆ.

Trees or shrubs. *Leaves* deciduous, alternate, 3-5-nerved at the base, stipulate. *Flowers* in catkins, one within each bract, diœcious, rarely monœcious or androgynous, bracteoles none. *Perianth* none. *Disk* of one or more scales or glands, or cupular. *MALE* flowers: *Stamens* 2 or more, filaments free or connate; anthers ovate-oblong, bursting longitudinally. *FEM.* flowers: *Ovary* sessile or stipitate, 1-colled, style short or none; stigmas short, notched or lobed; ovules few or many, on 2-4 subbasal or parietal placentas, erect, anatropous. *Fruit*, an ovoid or lanceolate 2-4-valved capsule. *Seeds* few or many, funicle with a pencil of long silky deciduous hairs, albumen none, cotyledons plano-convex; radicle short, inferior.—Species about 180, chiefly in N. temperate regions.

### *SALIX*, *Linn.*; *Fl. Brit. Ind.* v, 626.

Trees or shrubs, sometimes small and prostrate. *Leaves* usually narrow or small, entire or serrulate, pinni nerved; stipules various. *Flowers* small, diœcious, sessile, in erect, usually dense catkins; bracts small, entire or rarely toothed. *Perianth* none. *Disk* of 2 scales, anterior or posterior, or of one posterior scale,

fleshy or glandular. MALE flowers: Stamens 2, rarely 3 or more; filaments filiform, free, rarely connate; anthers usually small. FEM. flowers: Ovary sessile or stipitate; placentas 2; ovules usually 4-8; style usually short, with 2 short retuse or 2-fid arms. *Fruit*, a 2-valved capsule. *Seeds* with penicillate funicle; albumen none; cotyledons plano-convex; radicle inferior.—Species about 160, mostly in N. Temp. regions.

Stamens 4 or more; flowers appearing after the leaves:—

Leaves lanceolate, serrulate, capsule ovoid,  
on long pedicels . . . . . 1. *S. tetrasperma*.  
Leaves linear-lanceolate, entire; capsule  
ovoid-lanceolate, on short pedicels . . . . . 2. *S. acmophylla*.

1. ***S. tetrasperma*, Roxb.** *Cor. Pl. i*, 66, t. 97; *Fl. Ind. iii*, 573; *Royle Ill. 343*; *Brandis For. Fl.* 462, t. 58; *Ind. Trees* 636; *F. B. I. v*, 626; *Watt E. D.*; *Kanjidál For. Fl.* (ed. 2), 387; *Gamble Man.* 685; *Collett Fl. Siml.* 478; *Prain Beng. Pl.* 989; *Cooke Fl. Bomb.*, ii, 661.—*Vern. Bed, bent, baishi* (Hind.), *laila, bains* (N. W. Ind.), *bilsa, bhiusa* (Oudh), *jalmála* (Dehra Dun), *besa* (Bundelkhand), *bhynsh* (Bijnor).

A medium-sized tree or shrub. *Bark* rough with deep vertical furrows. *Young parts* silky, the branchlets and underside of leaves sometimes pubescent. *Leaves* 3-6 in. long, lanceolate or ovate-lanceolate, glaucous beneath, usually regularly serrulate; petioles  $\frac{1}{2}$ -1 in. long. *Male catkins* 2-4 in. long. *Flowers* scented. *Stamens* 5-10. *Fem. catkins* 3-5 in. long. *Capsules* glabrous, long-stalked, style short, with two spreading, usually entire stigmas. *Seeds* 4-6.

Abundant within the area, especially on the banks of streams and on moist swampy ground. It is common in Dehra Dun and on the Siwalik range, and along the Sub-Himalayan tracts of Rohilkhand and N. Oudh to the Gorakhpur district, and it occurs also in Bundelkhand and in the Ajmer district. The new foliage appears during Feb. and March, and it flowers from Feb. to April and sometimes again in the autumn. *DISTRIB.*: More or less throughout tropical and subtropical India from the Punjab eastwards to Manipur and Burma, ascending the Himalayan valleys up to 6,000 ft., and southwards to Travancore and to the Malay Peninsula and Java. It is not found in Ceylon nor in the more arid tracts of W. and Central India. The soft reddish porous wood is used for making gunpowder

charcoal. The branches are lopped for fodder, and the twigs are much used by basket-makers. Many varieties of this polymorphous plant are mentioned in the Fl. Brit. Ind., the majority of which must be regarded merely as representing geographical forms. Thus Sir Joseph Hooker distinguishes the prevalent N. W. Indian form as compared with the southern and eastern ones. In the former the leaves are usually longer and narrower and become pale-green or yellowish when dry, and the nerves are more oblique. The pale-coloured capsules also are larger and on shorter stalks. In the southern and eastern forms the leaves are usually shorter and broader and with the upper surface shining, and they are dark-brown when dry; the nerves too are nearly horizontal, and the capsules are smaller and dark-coloured and usually with longer and more slender stalks. From my own observations I am inclined to believe that the southern form extends as far north as Mt. Abu and Bundelkhand.

**S. acmophylla**, Boiss. *Diagn. vii*, 98; *Fl. Or. iv*, 1183; *Brandis For. Fl.*; *Ind. Trees* 636; *F. B. I. v*, 628; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 388; *Gamble Man.* 686.—*Vern. Jalmála.*

A moderate-sized glabrous tree, with the trunk up to 7 ft. in girth; branches lax, forming a rounded crown; branchlets often pendulous. Leaves 2-5 in. long, linear-lanceolate, the upper ones caudate-acuminate, entire or serrulate, glaucous beneath. Catkins short, shortly stalked; bracts scale-like, ovate or oblong, concave villous. *Male catkins* 1-2 in. long, cylindric, dense-flowered. *Stamens* 4-6. *Fem. catkins* nodding, 1 in. long, bracts deciduous. *Capsules* ovoid-oblong, on short stalks; stigmas sessile, short, entire.

Dehra Dun and Saharanpur forests, Siwalik range and Sub-Himalayan tracts from the Ganges westwards, often cultivated. Flowers after the leaves appear. *Distrib.* : Himalayan valleys up to 6,000 ft. and westwards to Afghanistan and Baluchistan where it is much cultivated for cattle fodder. It is also grown to some extent in gardens as an ornamental tree. Brandis regarded this tree as intermediate between *S. tetrasperma* and the W. African *S. Sufsuf*. A local form found in Dehra Dun with reddish fragile branches, gland-serrulate leaves, and male flowers always with 6 stamens may prove to be a distinct species.

**S. BABYLONICA**, Linn.; *Roxb. Fl. Ind. iii*, 754; *Brandis For. Fl.* 465, t. 59; *Ind. Trees* 637; *F. B. I. v*, 629; *Gamble Man.* 688.—Weeping willow.—Largely cultivated in the plains of N. W. India in gardens and on canal banks, also on the Himalaya up to 9,000 ft. It is culti-

vated in Afghanistan and in S. and Cent. Europe and in most sub-tropical countries. It may possibly be wild in Persia and Cent. Asia and in China.

#### CIV. CERATOPHYLLACEÆ.

Slender, fragile, branched, submerged herbs. *Leaves* whorled, dichotomously cleft into filiform minutely toothed lobes; *stipules* none. *Flowers* minute, monocious, axillary, sessile. *MALE*-flowers solitary. *Perianth* (or involucre) of 6-12 narrow subvalvate 2-fid segments. *Stamens* 10-30; filaments very short; anthers erect, extrorse, dehiscent longitudinally, connective truncate or 2-toothed at the apex. *FEM. flowers*: *Perianth* of the male. *Ovary* sessile, ovoid, 1-celled; ovule solitary, pendulous, orthotropous; style subulate, stigmatic on one side. *Frut*, a small coriaceous ovoid or ellipsoid subcompressed nutlet, terminating in a long subulate style with a spur projecting from the base on either side. *Seed* pendulous; testa membranous; albumen none; embryo straight; cotyledons thick; radicle short, inferior; plumule many-leaved.—A single genus, and one variable species distributed in all temperate and tropical countries.

*CERATOPHYLLUM*, Linn.; Fl. Brit. Ind. v, 639. Characters of the family.

*C. demersum*, Linn. Sp. Pl. 992; F. B. I. v, 639; Prain Beng. Pl. 990; Cooke Fl. Bomb. ii, 663. *C. verticillatum*, Roxb. Fl. Ind. iii, 624.—Vern. *Jhangi* (Beng.).

Whole plant 8 in.-3 ft. long, forming a much-branched tangle of slender branches and leaves which collapse in a tassel when taken out of the water. *Leaves* 1 in. long; segments spreading in water, variable in thickness and amount of toothing. *MALE* flowers solitary, in separate axils from the female but on the same plant. *Anthers* large, white. *FEM. flowers*. *Perianth* (or involucre) as in the male, often with an entire acute (not 2-fid) apex.

Rohilkhand near Moradabad (T. Thomson); Kheri in N. Oudh and Gorakhpur (Duthie); Saugor (Jerdon), and probably overlooked in many other localities. *DISTRIB.*: Bengal, ponds and ditches in all the provinces, and no doubt generally distributed throughout the greater part of India.

FLORA  
OF  
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AND OF THE  
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY  
J. F. DUTHIE, B.A., F.L.S.,  
FORMERLY DIRECTOR OF THE BOTANICAL DEPARTMENT OF  
NORTHERN INDIA.

VOL. III.  
PART II.

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CONIFERÆ TO JUNCACEÆ.

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## CLASS II.

### GYMNOSPERMS.

#### CV.—CONIFERÆ.

Trees or shrubs, wood-cells studded with disks. *Leaves* usually alternate, rigid, linear or subulate, rarely broad, solitary or fascicled in membranous sheaths. *Flowers* monœcious or diœcious; males in deciduous catkins; females solitary or in cones. *Perianth* none. **MALE** flowers: *stamens* many, filaments connate in a globose ovoid oblong or cylindric column; anthers 1- or more-celled, shortly stipitate or sessile round the axis of the column. **FEMALE** flowers: ovules one or more, sessile, naked, usually orthotropous, seated on a scale (an open carpel) which is free or adnate to the scale (bract) of a cone. *Seeds* often winged, testa thick or thin; albumen dense, fleshy; embryo axile, straight; cotyledons 2 or more; radicle terete, often attached to a crumpled thread-like suspensor.—Species about 350, chiefly in cold regions, rare in Trop. Africa and America, absent in the W. Peninsula of Indi and in Ceylon.

#### **PINUS**, Linn.; Fl. Brit. Ind. 651.

Evergreen monœcious trees. *Leaves* dimorphic, the primary consisting of small membranous scales; secondary linear in clusters of 2 or 3 or 5 in the axils of the primary, clusters girt at the base by a sheath of hyaline scales. **MALE** flowers in spikes. *Staminal column* ovoid, oblong or cylindric; anthers in many series, shortly stipitate, 2-celled, connective produced at the apex. **FEMALE** cones globose or ovoid, bracts spirally imbricate, *ovuliferous* scale much larger than the bracts; ovules 2, at the base of the scale, reflexed. *Ripe cone* ovoid or oblong, bracts obsolete or small; scales persistent, formed of the enlarged thickened usually woody *ovuliferous* scales the tips of which are often square and with a boss. *Seeds* 2, reversed, usually winged, the wing formed by the adhesion of the hard testa to a thin separable layer of the scale,

cotyledons 2 or more.—Species about 70, confined to the N. Hemisphere.

**P. longifolia.** Roxb. *Fl. Ind.* iii, 651; *Royle Ill.* 353, t. 85, f. 1; *Brandis For. Fl.* 506; *Ind. Trees* 690; *F. B. I. V.* 652; *Watt Comm. Prod. Ind.* 889; *Kanjild For. Fl. (ed. 2).* 431; *Gamble Man.* 706; *Collett Fl. Siml.* 485, fig. 158.—Vern. *Chir, chil* (W. Him.), *dhup* (Oudh).—Long-leaved pine.

A large more or less deciduous tree with symmetrical branches high up on the trunk and forming a rounded head of light foliage. Bark rough, reddish-brown outside, dark-red within, cut by deep fissures into large irregular thin plates. Leaves in clusters of three, 9-12 in. or longer, linear, slender, subtriquetrous. Sheaths persistent, fimbriate, greyish-brown. Male-spikes ovoid, cylindric, about  $\frac{3}{4}$  in. long. Fertile cones on short stiff stalks, spreading or recurved, solitary or in whorls of 3-5, ovoid-conical, 4-7 in. long when mature and about 3 in. in diam. above the base. Scales  $1\frac{1}{2}$  in. long and  $\frac{3}{4}$  in. broad; apex much thickened and with a 4-6-lobed tip which is beaked in the centre. Seeds, including wing,  $\frac{1}{2}$ -1 in. long; its wing obliquely oblanceolate, obtuse; cotyledons about 12.

Wild on the Saharanpur Siwalik range at 2-3,000 ft. It is cultivated in Dehra Dun and in many other places within the northern portion of the Upper Gangetic Plain. The tree flowers February to April, and the seeds are shed during the hot weather of the following year. The cones remain on the branches long after the seeds have been shed. DISTRIB.: Outer Himalayan ranges and in the valleys of the principal rivers from the Indus to Bhutan at elevations between 2,000 and 7,500 ft., reaching its highest altitude in Kumaon. In Sikkim and Bhutan it rarely rises to over 3,000 ft. The tree is gregarious in the Western Himalaya, where it forms pure forests over very extensive areas. The resin obtained from the sapwood of this tree is the most important of its products, which include tar, turpentine, colophony and charcoal as bye-products. The quantity of resin obtained per individual tree is much larger as compared with that of the 'Blue pine' (*Pinus excelsa*), but the quality is somewhat inferior. The timber is largely used by the hill men for building and other purposes. It is not very durable, especially when exposed to wet, and it is very liable both to insect and fungoid attacks, and is altogether inferior to that of the 'Blue pine.' This latter tree (*P. excelsa*) occurs abundantly in the Temp. Himalaya at elevations between 6,000 and 12,500 ft., extending from Kafristan on the west to Sikkim and Bhutan eastwards, except for certain gaps in Central and N.-W. Kumaon.—For

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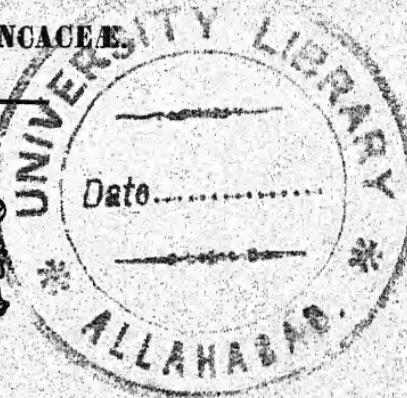
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further particulars regarding these two Himalayan pines see Gamble's "Manual of Indian Timbers" and Brandis' "Forest Flora of N.-W. and Central India."

The following non-indigenous conifers are met with in gardens within the area of the Upper Gangetic Plain :—

**THUYA ORIENTALIS**, *L.*—A small evergreen tree of China and Japan, and sometimes known as the *Chinese Arbor-Vitæ*.

**CUPRESSUS SEMPERVIRENS**, *L.*—A tall evergreen tree, indigenous in Persia, Syria and Asia Minor.—Cypress. Vern.—*Sarás* (Hind.) Largely cultivated in the plains of N.-W. India, especially the fastigiate variety.

**JUNIPERUS MACROPODA**, *Boiss.*—Himalayan Pencil Cedar. A small or medium sized tree of the inner dry ranges of the Western Himalaya, ascending to 14,000 ft. in Ladák, and found as low down as 5,000 ft. on the Indus. It has been cultivated in the Saharanpur Garden, where it appears to thrive.—Vern. *Dhup*.

**ARAUCARIA CUNNINGHAMII** *Ait.*—A tall handsome evergreen tree, introduced from Queensland. There used to be a fine specimen of this tree in the Saharanpur Garden.

**ARAUCARIA BIDWILLI**, *Hook.*—The *Bunya-Bunya* pine of N.-E. Australia. This tree also thrives at Saharanpur and in other gardens of North-West India.

Belonging to the allied and remarkable family of *Cycadaceæ* some mention should be made of *Cycas revoluta*, Thunb., a Japanese species introduced into India, and often grown in gardens within the area of the Upper Gangetic Plain. It is a small palm-like evergreen tree with linear pinnately divided leaves arranged in terminal crowns.

### CLASS III.

#### MONOCOTYLEDONS.

##### CVI.—HYDROCHARITACEÆ.

Aquatic usually submerged herbs. *Leaves* undivided, usually narrow and ribbon-like, rarely with a distinct lamina. *Flowers* regular, monœcious or diœcious, rarely 2 sexual, enclosed in an

entire or 2-leaved spathe ; MALE flowers : stamens 3-12, in 1-4 series, anthers 2-celled. FEM. flowers : Solitary. Perianth superior. Sepals 3, green or petaloid. Petals membranous or none. Ovary 1-celled, inferior ; placentas 3-6, parietal or intruded and sometimes almost meeting at the axis ; styles or style-arms 3-12 ; ovules many on each placenta, anatropous or orthotropous. Fruit globose or ovoid, dry or pulpy, rarely dehiscent. Seeds few or many, albumen none, embryo smooth or lineate.—Species about 50, in tropical and temperate regions of the world, some of them marine.

Stems branching, leafy ; leaves small ; spathes small, sessile :—

Leaves whorled or the lower ones opposite ; styles undivided ; ovules anatropous . 1. *Hydrilla*.

Leaves scattered, fascicled or somewhat whorled ; styles notched ; ovules orthotropous . 2. *Lagarosiphon*.

Stems none, or with stolons only, or a creeping rootstock :—

Leaves all long, narrow and sessile ; male scapes several-fld. :—

Perianth single . . . . . 3. *Vallisneria*.

Perianth double . . . . . 4. *Blyxa*.

Leaves mostly or all petioled :—

Ovary not beaked ; fruit without wings ; leaves all petioled ; male scapes 2-3-fld. . 5. *Hydrocharis*.

Ovary beaked ; fruit winged, submerged ; leaves narrow, the floating ones long-petioled ; flowers solitary . . . . . 6. *Ottelia*.

#### 1. HYDRILLA, Rich.; Fl. Brit. Ind. v, 659.

A submerged leafy freshwater herb. Leaves short, usually opposite below, 3-4-nately whorled above. Flowers minute, diœcious, the males shortly pedicelled, solitary in a subglobose muricate spathe ; females sessile, 1-2 in a tubular 2-toothed spathe. MALE flowers : Sepals 3, ovate or obovate, green. Petals 3, oblong or cuneiform. Stamens 3 ; anthers large, reniform, opening elastically. Pistillode minute. FEM. flowers : Sepals 3, linear, green,

*Petals* 3, narrow. *Ovary* produced beyond the spathe in a filiform beak, 1-celled; styles 2-3, linear, undivided, stigmas fimbriate, ovules anatropous. *Fruit* subulate, smooth or muricate. *Seeds* 2-3, minute, oblong, testa shortly produced at each end.—A single species found throughout India and in Ceylon extending to Britain and C. Europe, Mauritius, Madagascar, Trop. Asia and Australia.

**H. verticillata.** Royle Ill. 376; F. B. I. V, 659; Watt E. D.; Prain Beng. Pl. 995; Cooke Fl. Bomb. ii, 668. *Serpicula verticillata*, Linn. f.; Roxb. Fl. Ind. iii, 578. *Vallisneria verticillata*, Roxb. Fl. Ind. iii, 751.

*Stems* slender, 1 ft. or more long, branching, flaccid, often rooting at the nodes; branches with a short sheathing leaf at the base. *Leaves* sessile, 4-8 in a whorl, the lowest often opposite,  $\frac{1}{4}$ - $\frac{3}{8}$  in. long, linear or linear-oblong, apiculata, entire or serrulate, midrib prominent. *Flowers*  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Perianth-segments* very variable. *Fruit* smooth or muricate.

Abundant throughout the area of this flora in still or slowly running water; common also in all India and in Ceylon. *DISTRIB.*: See under the genus. The small membranous spathes of the male-flowers ultimately split and liberate the flowers which rise to the surface of the water, where they float, expand and scatter their pollen. Sugar-refiners in India use this plant, whilst moist, for covering the surface of their sugar in order to produce a slow percolation of moisture (See Royle Ill. l. c.).

## 2. LAGAROSIPHON, Harv.; Fl. Brit. Ind. v, 659.

Submerged fresh-water herbs. *Leaves* scattered, fascicled or somewhat whorled; lower opposite, serrulate. *Flowers* dioecious. *MALE* flowers minute, many in an ovoid 2-fid. axillary spathe. *Sepals* petaloid. *Petals* rather shorter. *Stamens* 2 or 3, filaments short, anthers ovate, with often 2 or 3 *staminodes*. *Pistillode* none. *FEM.* flowers: *Staminodes* none. *Ovary* oblong, produced into a filiform beak; styles 3, stout, notched; ovules many, orthotropous. *Fruit* ovoid oblong or linear, pericarp membranous. *Seeds* many, testa with a mucous coat.—Species about 12, in India, Africa and Madagascar.

*L. Roxburghii*, Benth. in Gen. Pl. iii, 451; F. B. I. V, 659; Prain Beng. Pl. 995; Cooke Fl. Bomb. ii, 669. *Vallisneria alternifolia*, Roxb. Fl. Ind. iii, 750.

Stems filiform, 2-3 ft. long; roots fibrous; upper branches floating. Leaves sessile, alternate and opposite, 3-4 in. long, oblong-lanceolate, acute, minutely serrulate. MALE flowers: Spathe ovoid, at length 2-valved, enclosing many minute shortly stalked flowers. Sepals 2; anthers opening transversely. FEM. flowers: Spathe  $\frac{1}{2}$  in. long, 2; anthers 2-fid. Ovary lanceolate, tipped with a filiform flexuous beak.

Common within the area in tanks and streams. DISTRIB.: Throughout the plains of India and in Ceylon, extending to China and Japan.

3. *VALLISNERIA*, Linn.; Fl. Brit. Ind. v, 660.

Submerged tufted stemless stoloniferous herbs. Leaves very long, linear. Flowers dioecious, the males numerous, minute, in an ovoid 3-lobed shortly peduncled spathe, the females solitary in a tubular 3-toothed spathe terminal on a very long filiform spiral scape; sepals 3, petals 3, minute or none. MALE flowers: Stamens 1-3, filaments rather thick, anthers didymous. Pistillode none. FEM. flowers: Staminodes 3, each 2-fid. Ovary narrow, not produced upwards; stigmas 3, broad, notched, ovules numerous. Fruit linear, included in the spathe. Seeds numerous, oblong, testa membranous.—Species about 4, in the warmer regions of both hemispheres.

*V. spiralis*, Linn. Sp. Pl. 1015; F. B. I. V, 660; Watt E. D.; Prain Beng. Pl. 996; Cooke Fl. Bomb. ii, 669. *V. spiralooides*, Roxb. Fl. Ind. iii, 750.

Leaves radical, narrowly linear, varying in length with the depth of the water, translucent, entire, or serrulate at the tips. MALE flowers many, minute, in shortly stalked spathes; when ready to open they become detached and rise to the surface of the water, the expanded perianth acting as a float. FEMALE flowers solitary within a 3-toothed spathe and borne on a long spiral stalk, the uncoiling of which brings the flower to the surface to be fertilized by the floating males, after which the female scape coils up again into a close spiral

dragging the young fertilized female flower to within a small distance of the muddy bottom of the water to ripen.

Abundant within the area. **DISTRIB.** :—More or less throughout India and in Ceylon, extending westwards to Spain, and in most warm regions of the World.

**4. BLYXA.** Thouars ; Fl. Brit. Ind. v, 660.

Annual, submerged, tufted, scapigerous herbs. *Leaves* linear, acute, entire or minutely serrulate. *Flowers* 2-sexual or dicœcious ; scapes long or short ; males pedicelled, several in a tubular 2-toothed spathe, long-peduncled ; 2-sexual or fem. flowers solitary, sessile within a tubular 2-toothed spathe. *Sepals* 3, linear. *Petals* 3, linear, longer than the sepals. **MALE** flowers : *Stamens* normally 3-seriate, 1 or more often reduced to staminodes ; anthers narrow, erect. *Pistillodes* 3, slender. **FEM.** flowers solitary. *Staminodes* none or minute. *Ovary* linear, 1-celled, beaked ; style very short ; stigmas 3, filiform, ovules many. *Fruit* linear, included in the ribbed narrow ventricose spathe ; pericarp membranous. *Seeds* many, oblong, smooth or tubercled, often tailed.—Species 7 or 8, in Trop. Asia, Madagascar, Australia and in Sumatra.

Leaves not serrulate ; flowers dicœcious ;  
stamens 8 . . . . . 1. *B. Roxburghii*.  
Leaves serrulate ; flowers 2-sexual ; stamens 3 2. *B. oryzetorum*.

**1. B. Roxburghii**, Rich. in Mem. Inst. Fr. (1881) 77, t. 5 ; F. B. I. V., 660 ; Prain Beng. Pl. 996 ; Cooke Fl. Bomb. ii, 670. *Vallisneria octandra*, Roxb. ; Fl. Ind. iii, 572.—Vern. *Syala* (Beng.).

A submerged tufted annual. *Leaves* radical, 8-24 in. long, linear, entire, broad at the base, finely acuminate at the apex. *Flowers* dicœcious, white. **MALE** flowers : *Scape* straight, as long as or longer than the leaves. *Stamens* 8 ; filaments unequal, shorter than the petals. **FEM.** flowers : *Scape* shorter and thicker than in the males. *Fruit* 2-4 in. long. *Seeds*  $\frac{1}{2}$  in. long, distinctly tuberculate, shortly tailed.

I have seen no specimens from the Upper Gangetic Plains, but being widely distributed in Bengal in still water it has in all probability been overlooked. It is said to be plentiful throughout the Bombay Presidency, and is found also in Malay Peninsula and in Australia.

2. *B. oryzetorum*, Hook. f. in *F. B. I. V*, 661; *Prain Beng.* *Pl. 997*. *Diplosiphon oryzetorum*, *Dcne. in Jacquem. Voy. Bot.* *167*, *t. 167*.

A submerged tufted annual. *Leaves* 4-6 in. long, with serrulate edges. *Scape* very short. *Flowers* 2 sexual. *Stamens* 3. *Capsule* 1-1½ in. long by  $\frac{1}{2}$  in. wide. *Seeds*  $\frac{1}{4}$  in., sparsely tubercled; tails none or very short.

Bundelkhand (Edgeworth, No. 9002). *DISTRIB.* : Kashmir (Jacquemont), also on the Khasia Mountains.

#### 5. HYDROCHARIS, Linn. ; Fl. Brit. Ind. v, 662.

Aquatic floating herbs. *Leaves* petioled, orbicular or reniform, entire. *Flowers* monoecious; males 2-3 in a peduncled 2-foliate spathe; females solitary within a spathe. *Sepals* 3, herbaceous. *Petals* 3, white, membranous. MALE flowers. *Stamens* 6 or 9; staminodes 6 or 3; filaments forked, anther-cells basifix. FEMALE flowers. *Staminodes* 6, in pairs. *Ovary* ovoid, 6-celled; ovules many; stigmas 6, linear, 2-fid. *Fruit* an ovoid or oblong fleshy berry, 6-celled. *Seeds* numerous; testa pulpy, filled with spiral vessels; embryo ovoid.—Species 2 or 3, in Europe and Asia.

*H. cellulosa*, *Buch.-Ham.* in *Wall. Cat. 5042*; *Prain Beng.* *Pl. 997*. *H. Morsus-Ranae*, *F. B. I. V*, 662 (in part); *Royle Ill.* 377.

Prain in his Beng. Plants follows Buchanan-Hamilton in considering this plant as specifically distinct from the European *H. Morsus-Ranae*, to which it has been referred in the Fl. Brit. Ind. The reniform leaves are much less deeply lobed at the base, and after flowering they become very much enlarged. The male flowers contain 12 antheriferous stamens, 3 of which are sterile. Within the area of this flora specimens of this plant were collected by Buchanan-Hamilton in the Gorakhpur district, and by the present writer in the N. Oudh district of Bahrach. The plant appears to be common also in N. and Central Bengal.

#### 6. OTTELIA, Pers. ; Fl. Brit. Ind. v, 662.

Submerged or partially floating fresh-water herbs with fibrous roots. *Leaves* radical, crowded, the submerged narrow and shortly

petioled, the floating long-petioled, ovate-lanceolate oblong or cordate. *Flowers* solitary, 2-sexual, sessile within a tubular long-peduncled spathe. *Sepals* 3, linear or oblong. *Petals* 3, longer than the sepals, obovate or orbicular, with fleshy basal appendages. *Stamens* 6-15, in 2-5 series, anthers erect. *Ovary* oblong, beaked, almost 6-celled; styles 6, linear, 2-fid.; ovules many, placentas diffuse. *Fruit* oblong, 6-valved, enclosed in the spathe, 3-6-winged. *Seeds* many, oblong, testa pulpy.—Species 6 or 7, in tropical or subtropical regions of the world.

*O. alismoides*, Pers. *Syn. i*, 400; *F. B. I. V*, 662; *Prain Beng. Pl.* 997; *Cooke Fl. Bomb. ii*, 671. *Damasonium indicum*, Willd; *Roxb. Fl. Ind. ii*, 216.

A succulent flaccid herb, submerged or partially floating. *Leaves* variable, 2-6 in. long, oblong or orbicular, cordate, membranous, undulate, 7-11-nerved; petioles trigonous. *Spathe* 1-1½ in. long, 1-flowered, 5-6-winged; peduncles varying in length with the depth of the water; wings of spathe unequal, undulate; mouth 5-6-toothed. *Sepals* small, oblong, green. *Petals* suborbicular, about 1 in. broad, white with yellow base, reticulate-veined. *Ovary* narrowly oblong; placentas 6-12. *Fruit* 1-1½ in. long, ellipsoid, crowned by the persistent perianth.

Abundant within the area of this flora, in tanks and slow-running water.

DISTRIB. : Throughout India and in Ceylon, extending to Australia.

## CVII.—ORCHIDACEÆ.

Herbs of various habit, rarely shrubby, of two principal forms: either (1) terrestrial tuberous-rooted herbs with annual herbaceous simple stems and solitary or spicate or racemose flowers; or (2) epiphytes with perennial stems or branches variously thickened and often forming a pseudobulb, flowering from the top sides or base of the pseudobulb; bracts usually present. *Flowers* 2-sexual, irregular, often showy. *Perianth* superior, of 6 free or variously combined segments in two series; 3 outer segments (*sepals*) more or less alike, the 2 lateral sometimes connate in a short or long sac or spur-like base (*mentum*); 3 inner (*petals*) dissimilar, the 2 lateral alike, the other (*lip*) usually very differently shaped. *Stamens* and style united in a column opposite the lip; fertile anthers usually

one (2 in *Cypripediæ*), on the front or top or back of the column and free or adnate to it, 2-celled or by subdivision 4-celled; top of the column sometimes produced towards the lip into a beak (*rostellum*); pollen-grains usually coherent in each cell into 1, 2, or 4 pairs of oblong globose or pyriform waxy or powdery masses (*pollinia*), which are free or attached by pairs or fours immediately, or by a stalk (*caudicle*) to a gland. *Ovary* inferior, 1-celled, usually linear or twisted; stigma one or two viscid spots on the top or concave face of the column, opposite the lip and below the anther, rarely discoid and above the two anthers (*in Cypripediæ*); ovules many, minute. *Fruit* a capsule, usually opening by 3 or 6 longitudinal fissures, rarely fleshy and subindehiscent. *Seeds* many, minute, with a lax hyaline testa enclosing a homogeneous nucleus.—Species about 5,000, in temperate and tropical regions, rarely arctic.

Anther single :—

Pollinia waxy :—

Pollinia free, or those of each cell held together at the base by a viscid appendage, not attached by their bases or by a caudicle to the rostellum :—

Pollinia 4 :—

Leaves equitant, coriaceous or fleshy.

Epiphytic her . . . . . 1. OBERONIA.

Leaves not equitant. Usually terrestrial herbs.—

Leaves membranous, rarely coriaceous :—

Lip superior, with basal auricles; column very short . . . .

2. MICROSTYLIS.

Lip inferior, without basal auricles; column long . . . .

3. LIPARIS.

Epiphytic herbs with coriaceous leaves :—

Stems solitary or cespitose, or composed of discrete pseudobulbs basally attached on a long or short rhizome; column prolonged into a foot :—

Lip not articulate on the foot of the column . . . . .

4. DENDROBIUM.

Lip articulate on the foot of the column and mobile . . . . .

5. BULBOPHYLLUM.

Stems jointed, composed of elongated pseudobulbs attached to a woody core; leaves solitary or in pairs, chartaceous; column without a foot . . . . .

6. PHOLIDOTA.

Pollinia 8

Terrestrial herbs without pseudobulbs :—

Scapes from a stout rhizome, flowering before the leaves appear . . . . .

7. PACHYSTOMA.

Stems leafy; flowers large, appearing with the leaves . . . . .

8. THUNIA.

Pseudobulbous epiphytes; column with a long foot . . . . .

9. ERIA.

Pollinia attached singly or in pairs or fours through one or rarely two caudicles to a stigmatic gland :—

Pollinia 2, rarely 4 in *Cymbidium* :—

Terrestrial glabrous herbs with fleshy tubers or rhizomes, rarely pseudobulbous; flowers in peduncled racemes; leaves chartaceous or membranous, plicate —

Lip distinctly 3-lobed, saccate or spurred at the base; inflorescence straight . . . . .

10. EULOPHIA.

Lip obscurely 3-lobed, widely ventricose at the base, but not spurred; inflorescence at first decurved . . . . .

11. GEODORUM.

Epiphytic herbs, rarely terrestrial or leafless, usually with long linear coriaceous leaves sheathing on a large fleshy pseudobulb; 'scapes racemose, column footless or very slightly produced; lip not spurred

12. CYMBIDIUM.

Epiphytic herbs, never terrestrial; pseudobulbs none :—

Stem very short, leaves few, crowded, pendulous, broad, flat and softly coriaceous; flowers in long, often branching, racemes; lip with a long claw; midlobe 2-lobulate; lateral lobes fimbriate; spur bent . . . . 13. ORNITHOCHILUS.

Stems more or less elongate; leaves coriaceous, flat, or fleshy and terete :—

Lip not spurred; leaves terete . 14. LUISIA.

Lip spurred, adnate to the column or its foot; leaves flat, fiorate :—

Column with a long foot . . . . 15. AERIDES.

Column slightly produced into a foot :—

Spur with neither calli nor septum within :—

Spur compressed laterally, deep, pubescent at the mouth; side-lobes of lip none . . . .

16. RHYNCHOSTYLIS.

Spur not compressed, rarely (in *Vanda*) reduced to a gibbous swelling :—

Side-lobes of lip usually large (small in *Vanda Roxburghii*), spur widely funnel-shaped, glabrous at the mouth; flowers usually large (small in *Vanda parviflora*) caudicle of pollinia short and broad . . . . 17. VANDA.

Side-lobes of lip small or none ; spur narrow and cylindric, or short and widely saccate ; mouth naked or fimbriate ; caudicle of pollinia very narrow 18. *SACCOLABIUM*.

Spur within partially or completely occluded by calli :—

Spur occluded by a dorsal scale or by calli on the anterior or posterior walls, but without a septum . . . . 19. *CLEISOSTOMA*.

Spur within partially occluded by calli and divided by a vertical antero-posterior septum into two lateral chambers . . . . 20. *SARCANTHUS*.

Pollinia powdery or lamellate, not waxy :—

Anther terminal, pollinia 2 or 4 ; leaf solitary, radical, appearing after the flowers . . . . 21. *POGONIA*.

Anther dorsal ; pollinia 2, bipartite ; leaves several, appearing with the flower, racemes drooping ; lip with a concave or saccate much depressed hypochile jointed at a right angle to the epichile . . . . 22. *EPIPACTIS*.

Stigma single, anticus ; lip saccate, the sac usually setose within . . . . 23. *GOODYERA*.

Stigmas two, distant, lateral ; pollinia bipartite ; lip saccate, the sac with calli of laminae within . . . . 24. *ZEUXINE*.

Anthers two, each with one perfect cell ; cells sessile on the column, remote or contiguous, always separate ; pollinia 2, often bipartite, adnate with or without caudicles to separate glands ; leaves flat, membranous. Terrestrial herbs . . . . 25. *HABENARIA*.

## 1. OBERONIA, Lindl. ; Fl. Brit. Ind. v, 675.

Epiphytic herbs, with usually very short often tufted stems. Leaves coriaceous or fleshy, usually ensiform distichous and equitant, very rarely terete. Flowers minute, in dense sub-cylindric spikes, or racemes, expanding centrifugally. Sepals broadly ovate or oblong, subequal. Petals as wide as or narrower than the sepals. Lip larger than the sepals, 2-4-lobed, the hypochile more or less concave. Column very short and stout, rarely winged. Anther terminal or incumbent; pollinia 4, cohering in pairs, waxy.—Species about 60, Indo-Malayan region, extending to China, Australia and the Pacific Islands.

Lip without lateral lobes or basal auricles . . 1. *O. pachyrachis*.

Lip with lateral lobes :—

Lip oblong, with small lateral lobes . . . . 2. *O. Falconeri*.

Lip obovate, with large broad lateral lobes . . 3. *O. ensiformis*.

1. *O. pachyrachis*, Reichb. f. in Herb. Kew. ex Hook. f. in F. B. I. V, 681; King and Pantl. in Ann. R. Bot. Gard. Calc. viii, 4, t. 3; Duthie id., ix, pt. 2, 85.

Stems very short, tufted. Leaves 3-4 in. long, narrowly ensiform and slightly falcate, acute. Peduncle of inflorescence, short, broad, compressed, adnate to a leaf nearly to its apex. Spike 4-5 in. long, equaling or a little longer than its leaf. Flowers minute, pale-brown, sunk singly in rather distant pits in the fleshy rhachis; bracts ovate-rotund, irregularly serrulate. Sepals elliptic, obtuse, glandular on the back, not reflexed. Petals smaller, linear-oblong, obtuse; subentire. Lip without lateral lobes or basal auricles, orbicular-elliptic, obtuse, concave, entire or slightly erose at the apex and with a deep depression at the base. Capsule short, turgid, often gibbous; ribs not prominent.

Dehra Dun, on trunks and branches of trees (Vicary, Falconer, Duthie, etc.). Flowers after the rainy season. DISTRIB.: Outer ranges of Himalaya from Garhwal eastwards to Sikkim, up to 4,000 ft.; also on the Khasia Hills.

2. *O. Falconeri*, Hook. f. in F. B. I. V, 678; Ic. Pl. t. 1780; Prain Beng. Pl. 1004; Duthie in Ann. R. Bot. Gard. Calc. ix, pt. 2, 86, t. 94; Cooke Fl. Bomb. ii, 676. *O. iridifolia*, Wall. (not of Lindl.).

*Stems* short. *Leaves* 1-2½ in. long, broadly ensiform, straight or falcate, acute, coriaceous. *Peduncle* of inflorescence, stout, shorter than the leaves, terete, bracteate. *Racemes* erect or decurved, longer than the leaves; rhachis stout, deeply grooved in fruit. *Flowers* minute, shortly stalked; floral bract longer than ovary, ovate-lanceolate, acuminate, the margins serrulate. *Sepals* and *petals* brownish-yellow. *Sepals* ovate, acute, reflexed. *Petals* spreading, falcately lanceolate, obtuse, longer and narrower than the sepals. *Lip* oblong or subquadrate, green, the upper surface glistening with many gland-like specks; lateral lobes small, with truncate emarginate tips; the apex with two small incurved obtuse lobes separated by a broad sinus. *Anther* obovate, its lip emarginate. *Capsule*  $\frac{1}{2}$ - $\frac{3}{8}$  in. long, shortly stalked.

Dehra Dun (Wallich, Falconer, Duthie, etc.). Common as an epiphyte on mango trees. Flowers in Sep. *DISTRIB.* : Outer ranges of Himalaya from the Jumna to Sikkim, up to 3,500 ft.; also on the Khasia Hills and in Chota Nagpur and in the Konkan.

**3. *O. ensiformis*, Lindl.** *Fol. Orch. Oberon.* 4; *F. B. I. V*, 679; *King and Pantl. in Ann. R. Bot. Gard. Calc.* viii, 9, t. 9; *Duthie id* ix, pt. 2, 86.

*Stems* 2½-3½ ft. long, *Leaves* 10-18 in. long and up to 3 in. wide, linear-ensiform, acuminate, falcate. *Inflorescence* erect, shorter than the leaves, subtruncate, its peduncle 2-2½ in. long, bearing many minute lanceolate appressed pale bracteoles; raceme about twice the length of the peduncle; its rhachis thick, fleshy, terete; floral bracts longer than the ovary, convolute, ovate-rotund, subacute, erose. *Flowers*  $\frac{1}{10}$  in. long, not sunk in the rhachis, pale-brown. *Sepals* reflexed, subequal, broadly ovate, subacute, entire not ciliolate. *Petals* ovate, subacute, stiffly pubescent, the edges entire and ciliolate. *Lip* twice as long as the sepals, 3-lobed, with two large rounded entire basal lobes; mesochile subquadrate, smooth, slightly concave, bearing on its edges two large projecting blister-like processes; terminal lobe obtusiform, with two rounded lobules separated by a broad subquadrate apical sinus, the whole surface and margins of lip, except the smooth mesochile, clothed with stiff hairs.

Dehra Dun, chiefly on sal trees (Falconer, King, Mackinnon, Duthie). Flowers during Nov. *DISTRIB.* : Up to 3,000 ft. on the adjacent Himalaya, extending eastwards to Nepal, Sikkim and the Khasia Hills; recorded also from the Nilgiris.

2. **MICROSTYLIS**, Nutt. ; Fl. Brit. Ind. v, 686.

Terrestrial or epiphytic, rarely saprophytes, often pseudo-bulbous. *Leaves* one or more, membranous, plicate, continuous with their sheaths. *Flowers* small, in terminal racemes, resupinate. *Sepals* spreading or recurved, subequal. *Petals* narrower than the sepals and about as long. *Lip* adnate to base of column, usually flat, with or without basal lobes; apex emarginate or 2-3-lobed. *Column* usually very short with two short spreading arms. *Anther* subterminal, or accumbent, 2-celled; pollinia 4, ovoid or obovoid, waxy.—Species about 70, in temperate and tropical Asia and America.

**M. Mackinnonii.** *Duthie in Journ. As. Soc. Beng. lxxi, pt. 2, 37;*  
*Ann., R. Bot. Gard. Calcutta, ix, pt. 2, 88, t. 95.*

Terrestrial, whole plant up to 7 in. high. *Stem* short, swollen below, rising from the base of the previous year's pseudo-bulb. *Leaves* two or three, horizontal, unequal, the largest  $2\frac{1}{2}$  in. long by 1 in. broad, ovate, obtuse, cordate and amplexicaul at the base, fleshy; upper surface dark brownish-green; the lower surface purplish; nerves 3-7, reddish-purple, prominent beneath, the interspaces bullate. *Scape* about 3 in. long, sharply 4-angular. *Receptacle* about as long as the scape; bracts subulate, longer than the ovary, reflexed, persistent. *Flowers* sessile, about  $\frac{1}{2}$  in. long, dull-yellowish and reddish-purple. *Dorsal sepal* ovate-lanceolate, subacute; lateral shorter, subfalcate, edges of all reflexed. *Petals* linear, shorter than the sepals, reflexed. *Lip* with a prominent transverse rim dividing its basal and apical portions; basal lobes falcately ovate-lanceolate, often continuous or overlapping at the tips; apical portion deeply bifid and protruded, crimson-purple. *Column* with fleshy rounded arms. *Anthers* with a truncate or emarginate lip. *Ovary* clavate, not twisted.

Dehra Dun on Kalanga hill, at 2-3,000 ft. (P. W. Mackinnon). Flowers July and Aug. **DISTRIB.:** Outer ranges of Garhwal Himalaya, up to 6,000 ft., easily distinguished from *M. Wallichii* by its leaf-coloration; also the flowers are smaller and the lip is very differently shaped.

3. **LIPARIS**, Rich. ; Fl. Brit. Ind. v, 691.

Terrestrial or epiphytic herbs, with or without pseudobulbs. *Leaves* one or more, membranous or coriaceous, continuous with the sheath or thickened and jointed at the base. *Flowers* small.

in terminal racemes, resupinate or not. *Sepals* spreading or recurved, the margins usually revolute. *Petals* much narrower than the sepals and about as long. *Lip* adnate to the base of the column, usually broad, flat or deflexed from the middle, sometimes concave and with calli near the base. *Column* elongate, often arched, usually winged near the apex and tumid, or dilated and compressed at the base. *Anther* terminal; pollinia 4.—Species about 120, in temperate and tropical regions.

Leaf solitary, membranous . . . . .	1. <i>L. diodon</i> .
Leaves two, coriaceous . . . . .	2. <i>L. longipes</i> .

1. ***L. diodon***, Reichb. *f.* in *Linnæa* xli, 43; Ridley in *Journ. Linn. Soc.* xxii, 285; F. B. I. V, 693; Duthie in *Ann. R. Bot. Gard. Calc.* ix, part 2, 97.

Leaf solitary, elongate, spatulate, obtuse, membranous. *Scape* angled, naked; bracts minute. *Sepals* linear. *Petals* filiform. *Lip* cuneate, angled on both sides at the base, then dilated, subquadrate, crenulate, apiculate. *Column* slender, curved, 2-toothed at the base. *Anther* not beaked.

Dehra Dun (Hort. W. Sanders). I have seen no specimens of this plant.

2. ***L. longipes***, Lindl. in *Wall. Pl. As. Rar.* i, 31, t. 35; F. B. I. V, 703; K. & P. in *Ann. R. Bot. Gard. Calc.* viii, 29, t. 37; Duthie *id. ix*, part 2, 97. *L. spathulata*, Lindl.

Epiphytic. Pseudobulbs close together in a row, cylindric and stem like or swollen at the base, 3-6 in. long, with a few vertical striae and with tightly clasping sheaths. Leaves 2, jointed at the base upon the leaf-sheath or on pseudobulbs, 4-6 in. long, oblanceolate-oblong, subacute to acuminate, sometimes aristate. Inflorescence erect, shorter or longer than the leaves; peduncle slender, terete, ebracteate; raceme twice as long as the peduncle, many-flowered; floral bracts linear-lanceolate, shorter than the pedicelled ovary. Flowers about  $\frac{1}{2}$  in. long, pale yellowish-green. *Sepals* 1-nerved, linear-oblong, subacute. *Petals* shorter than the sepals, linear, obtuse, reflexed, and with recurved margins as are the sepals. *Lip* about as long as the lateral sepals, broadly oblong, recurved from about the middle, inner margins at the base much thickened so as to form triangular processes but without true calli; margins entire, the apex broad and shortly apiculate. *Column* slightly curved and with small rounded wings.

Dehra Dun (Falconer, Mackinnon, Duthie). Flowers in Sep. DISTRIB. : Subtrop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan and the Khasia Hills, also on the Nilgiris and in Ceylon, extending to China and to the Malay and Pacific Islands. A widely distributed and polymorphic species. The Dehra Dun plant agrees best with Lindley's *L. spathulata*, which has shorter and thicker pseudobulbs, rather broader leaves and shorter racemes than in the type. Hooker observes that it occurs frequently in company with the form having long pseudobulbs, and that intermediates abound.

4. **DENDROBIUM**, Swartz; Fl. Brit. Ind. v, 710.

Epiphytic herbs. *Pseudobulbs* short and fleshy or elongate and stem-like, usually tufted. *Leaves* usually sessile and with slender bases, never plicate. *Flowers* solitary or in fascicles or racemes, often large and showy. *Sepals* subequal, the lateral pair obliquely adnate to the foot of the column and forming with it a sac or mentum. *Petals* usually similar to the sepals. *Lip* sessile or clawed at the base, adnate to and incumbent on the foot of the column; side-lobes embracing the column, or spreading, or absent; terminal lobe broad or narrow, flat convex concave or saccate, the disk sometimes lamellate. *Column* short, with a long or short foot and with usually a nectar-secreting cavity at its extremity, the apex angled or 2-toothed. *Anther* 2-celled; pollinia 4, equal in length, usually all slightly coherent but sometimes in free pairs, ovoid or oblong, slightly compressed, waxy.—Species 700 or more, in Temp. and Trop. regions of both hemispheres.

Flowers small, not exceeding  $\frac{1}{2}$  in. across, dull-yellow with stripes of red spots. . . . . 1. *D. bicameratum*.

Flowers about  $1\frac{1}{2}$  in. across or larger:—

Basal portion of lip convolute:—

Apical portion of lip pale-yellow, basal portion white . . . . . 2. *D. primulinum*.

Lip pale-yellow with purple veins at the base . . . . . 3. *D. Pierardi*.

Lip convolute throughout its length, pale-yellow with reddish-purple veins . . . . . 4. *D. Gamblei*.

1. **D. bicameratum.** *Lindl.* in *Bot. Reg.* (1839), *Misc.* 85; *F. B. I.* V, 729; *K. & P. Ann. R. Bot. Gard. Calc.*, viii, 42, t. 56; *Duthie id. ix, part 2, 95*; *Prain Beng. Pl.* 1,009. *D. breviflorum* *Lindl.*? *D. bulbiflorum*, *Falc. mss. in F. B. I. l. c.*; *Id. Pl. t. 2028*.

*Stems* 12-18 in. long, clavate or fusiform. *Leaves* coriaceous, 3-4 in. long, linear-lanceolate to elliptic-oblong, obliquely and minutely 2-fid. at the apex. *Flowers* about  $\frac{1}{2}$  in. across, dingy-yellow speckled with stripes of red, densely crowded on a short sheathed peduncle; flowering bract sheathing the shortly stalked ovary. *Dorsal sepal* ovate-oblong, subacute; lateral pair triangular, concave, subacute. *Petals* about as long as the sepals, broadly elliptic, obtuse. *Lip* fleshy, concave, 3-lobed; side lobes small, erect, triangular, acute; mid-lobe very short, truncate, the disk fleshy and smooth. *Column* very short, with two large oblong nectar-secreting cells. *Mentum* urceolate. *Anther* fleshy.

Dehra Dun (Gollan, Gamble). Flowers in Aug. *DISTRIB.*: Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft., and eastwards to Sikkim, the Khasia Hills, and Burma; it occurs also on Parasnath in Behar.

2. **D. primulinum.** *Lindl.* in *Gard. Chron.* (1858) 223; *Journ. Linn. Soc. iii, 12*; *F. B. I.* v, 735; *Duthie in Ann. R. Bot. Gard. Calc. ix, pt. 2, 97, t. 98.*

*Stems* 10-12 in. long, pendulous. *Leaves* about 4 in. long, broadly oblong, coriaceous, the upper ones smaller. *Flowers* solitary from the nodes of the leafless stems, shortly pedicelled,  $2\frac{1}{2}$  in. across; floral bracts minute, emarginate. *Sepals* and *petals* white, or tinged with pink or pale-blue. *Sepals* narrowly lanceolate, acuminate, spreading or reflexed. *Petals* smaller, linear-lanceolate, acute, erect or spreading. *Lip* broadly oblong (when spread flat), very shortly clawed, about  $1\frac{1}{2}$  in. long and nearly as broad, convolute towards the base, with a broad central lamellate band, margins strongly ciliate; basal portion white; apical portion pale primrose-yellow, puberulous; *mentum* rounded. *Column* produced into a rather long foot and with 2 horn-like processes at the apex, pale-blue. *Anther* puberulous, its lip toothed.

Dehra Dun, at Nálapáni (Gamble). Flowers in April. *DISTRIB.* Outer Himalayan ranges of Garhwal up to about 3,000 ft. There has been some confusion in regard to the distribution of this species. Under *D. crepidatum* in the Fl. Brit. Ind. V, 740 Sir Joseph Hooker remarks. "A specimen in Herb. Kew, marked 'Garhwal, Falconer'

is perhaps a cultivated one." This evidently refers to the two scraps of *D. crepidatum* glued down on the same sheet with Falconer's specimens of *D. primulinum*. There is also on the same sheet Falconer's original ticket referring to the specimens of *D. primulinum* and bearing the manuscript name of *D. petrocarpum*. Both *D. primulinum* and *D. crepidatum* were found by Falconer, and they were no doubt cultivated in the Saharanpur Garden and sent thence to Kew under one name. The supposition that *D. primulinum* was ever found wild in Sikkim is probably an error.

**3. *D. Pierardii*, Roxb. in Hook. Exot. Fl. t. 9; Fl. Ind. iii, 483; F. B. I. V, 738; Prain Beng. Pl. 1009; K. & P. in Ann. R. Bot. Gard. Calc. viii, 51, t. 72; Duthie id. ix, pt. 2, 97.**

Stems slender, pendulous, 2-3 ft. long. Leaves sessile, 2-5 in. long, lanceolate to ovate-lanceolate, sub-acuminate, caducous. Flowers about  $1\frac{1}{2}$  in. across, solitary or 2-3 together, on very short minutely bracteate peduncles which proceed from the slightly swollen nodes of the leafless stems, rose-coloured or pale-purple, the lip yellow with purple radiating veins at the base. Sepals subequal, oblong-lanceolate, subacute. Petals elliptic, obtuse, as long as the sepals, but broader. Lip sub-orbicular (when spread out), without side-lobes, the claw very short, edges shortly ciliate on the apical half, basal portion convolute, upper surface pubescent. Column about equalling its foot in length the latter with a nectary at its extremity. Anther with a curved erose lip. Capsule about 2 in. long.

Dehra Dun, on the banks of the Song river and in the adjacent forests (Gamble, Mackinnon). Flowers in May. **DISTRIB.:** Outer ranges of the Kumaon Himalaya up to about 3,000 ft., extending eastwards to Nepal, Sikkim and the Khasia Hills; also in Assam, Bengal, Chota Nagpur and southwards to S. India and Tenasserim, and extending to China.

**4. *D. Gamblei*, King and Panil. in Journ. As. Soc. Beng. LXVI, part 2, 584; Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 99, t. 99.**

Stems slender, pendulous, 1-2 ft. long, with short scarious sheaths at the nodes. Leaves sessile, up to 3 in. long, subfalcately ovate-lanceolate, subacuminate, thick, caducous; veins obscure. Peduncles solitary or in pairs from the nodes of the leafless stems; floral bract very small, lanceolate, acuminate. Flowers about  $1\frac{1}{2}$  in. across, inodorous. Sepals and petals subequal, lanceolate, acuminate, with reflexed tips, pale greenish-yellow, 5-nerved. Lip about  $\frac{1}{2}$  in. long,

convolute throughout its length, broadly elliptic-oblong or subquadrate when spread out; margins fimbriate-serrate except at the cuneate and clawed base; apex obtusely cuspidate; upper surface with a broad central grooved band villous towards the apex; veins reddish-purple, bifurcating within the margin. Column nearly  $\frac{1}{2}$  in. long, its narrow elongate foot with a small ovate laciniate nectary at its base; mentum elongate, slightly curved and spur-like. Anther minutely papillose outside, its lip denticulate.

Dehra Dun (Gamble) on trees. Flowers June-August. DISTRIB.: Garhwal Himalaya, up to 3,000 ft. Recorded also as occurring on the Nilgiri Hills. It is closely allied to *D. macrostachyum*, Lindl a species of S. India and Ceylon.

**5. BULBOPHYLLUM**, Thouars; Fl. Brit. Ind. v, 752.

Epiphytic herbs. *Pseudobulbs* from a creeping rhizome, rarely none, 1 (rarely 2)-leaved. *Flowers* on scapes from the rhizome and usually close to the pseudobulbs, solitary, capitate, umbellate, or in spikes or racemes. *Sepals* subequal or the lateral pair rather longer than the dorsal one and free or connate under the lip. *Petals* usually smaller than the dorsal sepal. *Lip* jointed on the foot of the column, mobile, small and usually much recurved. *Column* very short, often 2-aristate at the apex. *Anther* 2-celled; pollinia 4, free, the two inner smaller (rarely suppressed).—Species nearly 200, chiefly in tropical and sub-tropical Asia, a few in Africa, America and Australia.

**B. polyrhizum**, Lindl. Gen. and Spec. Orch. 53; Hk. in F. B. I. v, 767; Ann. R. Bot. Gard. Calc. V, pt. 1, 15, t. 23; K. and P. id. viii, 70, t. 95; Duthie id. ix, pt. 2, 105.

*Rhizome* thread-like, branching; pseudobulbs crowded or distant, globular or ovoid, smooth, base broad. *Leaf*  $2\frac{1}{2}$  in. long, narrowly oblong, subacute, slightly narrowed to the sessile base, deciduous before the flowers open. *Scape* filiform, about 4 in. long, the sub-erect peduncle longer than the raceme, bearing 1 or 2 minute bracts; raceme inclined. *Flowers* about 6, distant, secund, pale-yellow,  $\frac{1}{2}$  in. long; floral bracts minute, oblong, about as long as the short stalk of ovary. *Sepals* spreading; dorsal one ovate, concave; lateral pair longer, oblong-lanceolate, subacute, 3-nerved. *Petals* much shorter than the sepals, broadly ovate, acute, 1-nerved. *Lip* stalked, deflexed, oblong, obtuse, scaberulous. *Column* shortly toothed, its foot short and slightly curved. *Anther* papillose, its lip acute.

Dehra Dun (Gamble) flowers during June and July. DISTRIB. : Kumaon in the Gori Valley, up to 4,500 ft. (Duthie), and from Nepal eastwards to Sikkim and on the Khasia and Naga Hills.

6. **PHOLIDOTA**, Lindl. ; Fl. Brit. Ind. v, 844.

Epiphytes with jointed and often branching stems, the internodes resembling pseudobulbs, or with tufted pseudobulbs. Leaves in pairs or solitary, membranous, many-nerved. Flowers small, racemose, subglobose, expanding from above downwards, usually drooping and distichous; peduncles bracteate, terminal or from the base of the pseudobulb; floral bracts large, persistent. Sepals concave. Petals narrower than sepals. Lip more or less cymbiform, usually without side-lobes. Column without a foot, short, hooded or winged at the apex. Anther subglobose; pollinia 4, waxy, subglobose or clavate, cohering in pairs to one or two membranes.—Species about 20, in India, Malaya and China.

Leaf solitary	·	·	·	·	·	·	1. <i>P. imbricata</i> .
Leaves in pairs	·	·	·	·	·	·	2. <i>P. articulata</i> , var. <i>Griffithii</i> .

1. **P. imbricata**, Lindl. in Hook. Fl. Exot. t. 138; Gen. & Spec. Orch. 37; F. B. I. v, 845; K. & P. in Ann. R. Bot. Gard. Calcutta, viii, 144, t. 201; Duthie id. ix, pt. 2, 115; Prain Beng. Pl. 1012; Cooke Fl. Bomb. ii, 688. Ptilocnema bracteatum, Don Prod. 33. Cymbidium imbricatum, Roxb. Fl. Ind. iii, 460

A pendent epiphyte. Pseudobulbs cespitose, cylindric, thickened at the base, 2-3 in. long, or shorter and more ovoid, usually partly enveloped in large fibrous sheaths. Leaf solitary, 6-12 in. long, elliptic-ob lanceolate or lanceolate, acute, tapering to the stout petiole, strongly 3-5-nerved. Inflorescence from the top of a pseudobulb, drooping, 8-10 in. long, lengthening in fruit; peduncle slender, as long as or longer than the dense many-flowered distichous raceme. Flowers about  $\frac{1}{2}$  in. long, white tinged with pink or yellow; fl. bract longer than the slender stalked ovary, convolute, subtund, minutely apiculate, many-nerved, persistent, pale-brown. Sepals  $\frac{1}{4}$  in. long; dorsal sepal orbicular, 3-nerved; lateral pair connate at the base, cymbiform, winged along the keel. Petals linear-oblong, subacute. Lip 3-lobed, saccate between the large rounded lateral lobes; terminal lobe divided at the apex into two small oblong lobules. Column

broad, its upper half winged. *Pollinia* clavate, attached in pairs to two small membranes. *Capsule* about  $\frac{1}{2}$  in. long, ellipsoid.

Dehra Dun (Mackinnon, Gamble, Duthie). Flowers June-Aug. DISTRIB.: Outer ranges of the Garhwal and Kumaon Himalaya up to 4,000 ft., and eastwards to Nepal, Sikkim and Bhutan; also on the Khasia Hills, in Chota Nagpur, Chittagong, Konkan and Kanara, and south to S. India and Ceylon; extending to the Andaman Islands, Burma, Malay Pen., China, Pacific Islands and Australia.

2. *P. articulata*, Lindl. in Wall. Cat. 1992, var. *Griffithii*, K. & P. in Ann. R. Bot. Card. Calc. viii, 147, t. 204; Duthie id. ix, pt. 2, 116. *P. Griffithii*, Hook. f. Ic. Pl. t. 1881; F. B. I. v, 845.

Internodes of pointed stems terete, slightly furrowed, 3-5 in. long, the nodes bearing a few short broad scarious sheaths. Leaves 2, narrowly oblong-lanceolate, 3-4 in. long, tapering at each end. *Racemes* 1-2 in. long, decurved; peduncles from the top of the pseudobulbs; rhachis flexuose; floral bracts  $\frac{1}{3}$  in. long, oblong, obtuse, pale-brown. *Flowers* white tinged with brown and pink. *Sepals*  $\frac{1}{3}$  in. long, the dorsal one broadly ovate or suborbicular; lateral ovate-lanceolate, 5-nerved. *Petals* elliptic-lanceolate. *Lip* cymbiform, with a didymous terminal lobe; side-lobes none; base with 5 lamellate nerves. *Column* suborbicular; rostellum ovate-acuminate. *Pollinia* subglobose.

Dehra Dun, on sal trees (Mackinnon Gamble). DISTRIB.: Outer ranges of Garhwal Himalaya up to 4,000 ft. and eastwards to Sikkim and the Khasia Hills. This plant is similar in most respects to the type, but smaller in all its parts, and the leaves are much narrower.

#### 7. PACHYSTOMA, Blume; Fl. Brit. Ind. v, 811.

Terrestrial herbs with rather thick rhizomes. *Leaves* solitary or in pairs, usually appearing after the flowers, long, narrow, many-nerved. *Flowers* rather small, pendulous, white or pale-purple, puberulous, in racemes or on long pale scapes with clasping striate sheaths; bracts often large and scarious. *Sepals* unequal, the dorsal one blunt, lateral subacute. *Petals* narrow, spatulate. *Lip* sessile on the footless column, erect; side-lobes oblong, acute; terminal small; disk with 3-5 deeply crested and fimbriate ridges. *Column* slender, clavate above. *Anther* dorsal; pollinia 8, pyriform, waxy, adhering to a single membrane.—Species 6-8, in India, Malaya and Africa.

*P. senile*, Reichb. f. in Bonpl. iii, 251; F. B. I. v, 812; K. & P. in Ann. R. Bot. Gard. Calc viii, 101, t. 140; Duthie id. ix, pt. 2, 108; Prain Beng. Pl. 1014.

An erect terrestrial herb, leafless when in flower. *Rhizome* rather stout, producing scapes and solitary leaves at intervals of about 2 in. *Leaf* longer than the scapes, linear, membranous, 4-5-nerved. *Scapes* about 12 in. high, clothed with many pale striate sheaths 1-2 in. long. *Racemes* many-flowered. *Flowers* about  $\frac{1}{2}$  in. across, greenish-white tinged with pink or purple, gland-puberulous; floral bract longer than the curved stalked pubescent ovary, erect, lanceolate, acuminate. *Sepals* unequal; dorsal oblong, rounded at apex; lateral pair spreading oblong-lanceolate, subacute. *Petals* narrowly spatulate, re-curved puberulous as are the sepals. *Lip* sessile on the base of the column, 3-lobed, broadly oblong, gibbous at the base, pubescent; side-lobes acutely falcate; terminal one suborbicular, recurved and abruptly acuminate at the apex; upper surface of disk with 5 stout crested ridges extending from base to apex. *Column* dilated upwards, puberulous. *Anther* on the back of the column, indistinctly 8-celled.

Dehra Dun (T. Thomson, Mackinnon); also in many localities within the area of this flora from the Jumna eastwards to Moradabad and N. Oudh. Flowers in April. *DISTRIB.*: Outer Himalayan ranges from Garhwal to Sikkim; also on the Khasia Hills, and eastwards to the Nicobar Islands, and the Malay Archipelago to S. China. It occurs also in N. Bengal and Chota Nagpur and extends southwards to S. India and Ceylon.

**8. THUNIA**, Reichb.; included under *Phaius* in Fl. Brit. Ind. v, 816.

Terrestrial, rarely epiphytic herbs. *Stems* slender or equally thickened along their entire length, elongate, leafy, with many foliaceous sheaths below. *Leaves* distichous, lanceolate, glaucous. *Flowers* appearing with leaves, large, showy, in terminal drooping racemes; bracts large, scarious. *Sepals* erecto-patent, subequal, lanceolate, acute. *Petals* like the sepals. *Lip* adnate to the base of the footless column, shortly spurred; side-lobes short, involving the column; mid-lobe fringed. *Anther* narrow, pendulous, incompletely 4-celled; pollinia 8, waxy, attached in fours to a granular membrane; rostellum 3-lobed.—Species about 9, in tropical and temperate regions of the Old World.

**T. venosa.**, Rolfe in *Orch. Rev.* (1905) 206; Cooke *Fl. Bomb. ii.*, 692. *Phaius albus*, Lindl. in Wall. *Pl. As. Rar. ii* (1831), 85 t. 198; *Bot. Reg.* (1838), t. 33 (not of Lindl.); *Bot. Mag. t. 3991*; *Paxt. Mag. Bot. xv*, 125; *F. B. I. v*, 818 in part; *K. & P. in Ann. R. Bot. Gard. Calc. viii*, 110, t. 153; *Duthie id. ix pt. 2*, 109; *Prain Beng. Pl.* 1014. *Limodorum bracteatum*, Roxb. *Fl. Ind.*, iii., 466.

Pseudobulbs none. Stems stout, erect, tufted, 1-3 ft. long, bearing many tubular sheaths at the base. Leaves many, sessile, 1½-3 ft. long, narrowly elliptic-lanceolate or oblong-lanceolate, acuminate, membranous, glaucous beneath, usually plicate. Racemes 4-6-flld. 4-6 in. long, shortly peduncled and with a single elongated sheath. Flowers 2-2½ in. long; bracts equalling or exceeding the long-stalked ovary, oblong, cymbiform, acute, pale-coloured. Lip broadly oblong-panduriform when spread out; lower half convolute into a tube; upper portion cucullate, forming a rounded shell-like mouth slightly acuminate, the margins undulate and unequally dentate; upper surface with 7-9 crested ridges. Spur horizontal, slightly bifid. Column with a short foot, somewhat winged at the apex. Pollinia unequal, elongate. Capsule 1½ in. long, narrowly elliptic.

Dehra Dun (Gamble, Mackinnon), sometimes found as an epiphyte on sal trees. Flowers in June. DISTRIB.: Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft. It extends eastwards to Sikkim, Assam, the Khasia Hills and Burma, and occurs also in Chota Nagpur. A variety with shorter and more congested racemes is mentioned by Cooke as having been found by Dalzell on the Matheran Hill in Konkan.

#### 9. ERIA, Lindl.; *Fl. Brit. Ind.* v, 785.

Epiphytic and usually pseudobulbous. Pseudobulbs often elongated and stem-like. Flowers never large, rarely showy, arranged in racemes spikes or heads or on 1-2-flowered pedicels, often pubescent or tomentose. Sepals free from each other, adnate to the long foot of the column and with it usually forming a spur-like or saccate mentum. Petals similar to the sepals. Lip sessile on the foot of the column and incumbent. Column short and straight or long and somewhat curved, prolonged below as a foot. Anther accumbent, imperfectly 4-celled or 8-celled; pollinia 8, pyriform or broadly obovoid, waxy, attached in fours by their

bases to a granular membrane, or sometimes all attached together to a single viscus.—Species over 300, chiefly in Tropical Asia.

Flowers in dense spikes, glabrous or sparsely hairy, not woolly . . . . . 1. *E. convallarioides*.

Flowers distant, sessile, on scapes, densely woolly outside . . . . . 2. *E. flava*.

1. *E. convallarioides*, Lindl. in Wall. Cat. 1975; Gen. & Sp. Orch. 70; F. B. I. v, 791; K. & P. in Ann. R. Bot. Gard. Calc. viii, 118, t. 161; Duthie id. ix, pt. 2. 110. *Octomeria spicata*, Don Prod. 31.

*Pseudobulbs* tufted, flattened, 3-7 in. long, covered when young with large loose sheaths. *Leaves* four to six, subcoriaceous, 4-7 in. long, elliptic-lanceolate or oblanceolate, acute, many-nerved, but not plicate. *Spikes* produced on the young growths, cylindric, decurved; peduncle about 1 in. long, stout, naked below. *Flowers* many, white tinged with yellow, densely crowded, subglobose, about  $\frac{1}{2}$  in. across, inodorous; floral bracts equaling the sessile pubescent ovary, ovate, lanceolate, concave. *Sepals* broadly ovate, obtuse; lateral pair deeply concave. *Petals* oblanceolate-oblong, spreading, nearly as long as the sepals but narrower. *Lip* obscurely 3-lobed, cuneate, concave, apex subacute, the disk without lamellæ. *Column* rather slender, with a long curved foot. *Pollinia* clavate, attached to a large translucent viscus. *Capsule* oblong, obtuse, not winged.

Dehra Dun (P. W. Mackinnon), flowering during Aug. and Sep. DISTRIB.: Outer Himalayan ranges from Garhwal eastwards to Nepal and Sikkim, up to 4,000 ft., also in Tenasserim.

2. *E. flava*, Lindl. in Wall. Cat. (in part); Gen. & Sp. Orch. 65; F. B. I. v, 801; K. & Panil. in Ann. R. Bot. Gard. Calc. viii, 126, t. 175; Duthie id. ix, pt. 2, 111; Prain Beng. Pl. 1013.

*Rhizome* stout, clothed with imbricating tubular sheaths. *Pseudobulbs* large, stem-like, of 4-6 nodes, 3-5 in. long, much compressed, sheathed at the base. *Leaves* 6-10 in. long, narrowly oblong, acuminate, tapering to the base, subcoriaceous. *Scapes* from the base of the pseudobulbs, about as long as the leaves, clothed with dense pale tomentum and with many sheaths at the base. *Flowers* distant, yellow,  $\frac{3}{4}$  in. across, densely white-woolly outside; floral bracts lanceolate, pilose, shorter than the pinkish pilose stalked ovary, shrivelling as the flowers open. *Dorsal sepal* small, lanceolate; lateral pair  $\frac{2}{3}$  in. long, triangular, spreading. *Petals* smaller than the dorsal

sepal, lying parallel over the column, narrowly oblong, tapering to the base and apex. *Lip* oblong, 3-lobed, tumid; side-lobes narrow, truncate at the apex, puberulous and with two long tapering ridges at their junction with the disk; terminal lobe oblong, acute, recurved, slightly 2-ridged, glabrous. *Column* erect, its foot at right angles to and longer than its body. *Ovary* pinkish and densely pilose. *Pollinia* small, compressed, attached to two granular membranes. *Capsule* cylindric,  $1\frac{1}{2}$ - $1\frac{3}{4}$  in. long.

Dehra Dun (Duthie, Mackinnon); flowering in April. DISTRIB.: Outer Himalayan ranges of Garhwál up to 4,000 ft. and eastwards to Bhutan; also in Chota Nagpur. In Sikkim specimens the base of the lip, on both surfaces, and the foot of the column are often blotched with reddish-purple.

**10. EULOPHIA, R. Br.; Fl. Brit. Ind. vi, 1.**

Terrestrial glabrous herbs with fleshy tubers or rhizomes rarely pseudobulbous. *Leaves* appearing with or after the flowers, long narrow and usually plicate. *Flowers* in racemes, rarely panicled, on a tall erect sheathed usually lateral scape. *Sepals* free, spreading, subequal. *Petals* somewhat similar to the sepals. *Lip* adnate to the base of the column or to its foot, saccate or shortly spurred at the base; side-lobes erect, embracing the column, rarely suppressed; midlobe spreading or recurved; disk usually ridged or crested. *Column* with or without a foot, its apex entire and often oblique, the margins occasionally winged or lobed. *Anther* terminal, 2-celled, sometimes with two apical processes; pollinia 2, globose, attached by a caudicle to the flat gland of the rostellum.—Species over 300, in tropical or subtropical Asia and Africa.

Column not or only slightly produced into a foot:—

Leaves appearing with the flowers:—

Lip with a short bent spur; bracts as long or longer than the ovary:—

Sepals spreading, linear-lanceolate, acuminate, green . . . . .

1. *E. herbacea*.

Sepals erect, ovate-obtuse, yellowish-brown . . . . .

2. *E. Mackinnonii*.

Lip saccate at the base; bracts shorter than the ovary . . . . .

3. *E. explanata*.

Leaves appearing after the flowers have opened:—

Terminal lobe of lip yellow . . . . . 4. *E. Hormusjiæ.*

Terminal lobe of lip purple . . . . . 5. *E. campestris.*

Column produced into a distinct foot:—

Lateral sepals inserted on the spur; basal lobes of lip obscure . . . . . 6. *E. nuda.*

Lateral sepals inserted on the foot of the column; lip with distinct basal lobes:—

Flowers not exceeding 1 in. diam., greenish-yellow tinged with purple . . . . . 7. *E. bicarinata.*

Flowers large, exceeding 1½ in. in diam., lemon-yellow, often spotted or streaked with lilac:—

Terminal lobe of lip  $\frac{1}{3}$  as long as the rhomboid-oblong basal lobes; spur saccate, blunt . . . . . 8. *E. flava.*

Terminal lobe of lip twice as long as the rounded basal lobes; spur short, curved, acute . . . . . 9. *E. obtusa.*

1. *E. herbacea*, Lindl. Gen. & Spec. Orch. 182; Royle Ill. 366; F. B. I. vi, 2; Duthie in Ann. R. Bot. Gard. Calc. ix, pl. 2, 123, t. 106; Cooke Fl. Bomb. ii, 693. *E. bicolor*, Lindl. in Journ. Lim. Soc. iii, 24 (not of Dalz.). *Limodorum bicolor*, Roxb. Fl. Ind. iii, 469.

Root tuberous, the tubers about 1½ in long, broadly ovate. *Pseudostem* 4-6 long. Leaves 6-10 in. long, linear-lanceolate, variable in breadth, many-nerved, plicate. *Flowering stem* stout, 2-3 ft. high, with a few sheathing bracts towards the base. *Raceme* short, 8-10-fld.; floral bracts about as long as the ovary, linear-lanceolate, acuminate, scarious. *Flowers* appearing with the leaves, about 2 in. across, white, tinged with green, fragrant. *Sepals*  $\frac{3}{5}$ -1½ in. long, spreading, linear-lanceolate, acuminate, green with pale margins; lateral pair adnate to the base of the column. *Petals* shorter than the sepals, pure white, elliptic or lanceolate, obtuse or acute. *Lip*  $\frac{2}{3}$  in. long, white tinged with green at the base; side-lobes small oblong, rounded at the apex; midlobe oblong, rounded at apex, margins crenate; disk with five median fimbriate lamellæ; spur very short subgeniculate, obtuse. *Column* stout, ½ in., curved and without a foot,

slightly winged. *Pollinia* transversely oblong, attached by a short broad caudicle to a triangular gland. *Capsule* about  $1\frac{1}{2}$  in., ellipsoid, slightly ribbed.

Dehra Dun (Mackinnon); Siwalik range (Vicary). Flowers during June and July. *DISTRIB.*: Outer ranges of W. Himalaya up to about 5,000 ft.; also found in the Bombay Presidency and in Mysore.

2. *E. Mackinnoni*, *Duthie in Journ. As. Soc. Beng. lxxi, pt. 2 (1902), 40*; *Ann. R. Bot. Gard. Calc. ix, pt. 2, 124, t. 107*. *E. bicolor* *Falc. mss. in Herb. Saharanpur (not of Lindl. nor of Dalz.)*.

Rhizome composed of a series of flattened triangular-shaped tubers. *Pseudostem* up to  $7\frac{1}{2}$  in., proceeding from the summit of the bulb-like current year's tuber. Leaves usually two, appearing with the flowers, up to  $2\frac{1}{2}$  ft. long and 2-3 in. wide, broadly lanceolate, acuminate, tapering into long sheaths and with a few leafless sheaths below, prominently nerved and plicate. *Flowering stem* much shorter than the leaves, rising from the side of the current year's tuber and bearing 3 or 4 loosely sheathing bracts. *Flowers* 8-10, in a lax raceme, spreading or at length deflexed,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; floral bracts equalling or exceeding the ovary, linear-lanceolate, acuminate, persistent. *Sepals* and *petals* erect, fleshy, yellow tinged with reddish-brown, the veins prominent outside; dorsal sepal  $\frac{3}{4}$  in. long, ovate, obtuse, subcordate at the base, the margin inflexed at the apex; lateral pair rather longer, unequal at the base. *Petals* shorter than the sepals, oblong-ovate, obtuse, their margins overlapping and inflexed at the apex. *Lip* 3-lobed, with long erect rather shallow side-lobes; its body streaked with purple on a yellow ground and with three prominent white lamellæ which extend into a carunculate area to within the base of the terminal lobe; terminal lobe broad, yellow rounded and with undulate edges. *Spur* short, geniculate. *Column* short, broadly winged, its foot very slightly produced. *Anther* yellow, with two short purple horns at the apex, its lip bifid. *Pollinia*, transversely oval, attached by a broad caudicle to a shallow crescent shaped gland.

Dehra Dun (Mackinnon, Duthie); Siwalik range (Vicary); N. Oudh in the Bahrach district (Duthie); N. W. India Royle. Flowers in July and Aug. *DISTRIB.*: Cent. Prov. in the Raipur district (J. Marten). This plant appears to be most nearly related to *E. geniculata*, King and Pantl., a very rare Sikkim species, but differing in the shape of the rhizome, the much broader leaves and in the shape and colouring of the lip.

3. *E. explanata*, Lindl. Gen. & Sp. Orch. 180; F. B. I. vi, 3; Duthie in Ann. ix, part 2, 125, t. 108. *Dipodium scariosum*, Herb. Ham.; Hook. Ic. Pl. 1882.

*Pseudobulb* about 2 in. long, ovoid, annulated. *Pseudo-stem* 1½-2 in. long. *Leaves* young when the plant is flowering, attaining, when fully developed, about 10 in. in length and 4 in. in width, broadly elliptic-lanceolate, acuminate, tapering below into a short petiole 7-veined. *Flowering stem* about 10 in. long, arising from below the summit of the pseudobulb, bearing a few loose sheaths at its base. *Raceme* 5-6 in. long, laxly many-fld.; flowering bract lanceolate, acuminate, much shorter than the slender ovary. *Flowers* about 1 in. across. Sepals and petals subequal, spreading, white or yellowish streaked with reddish-purple. *Sepals* spathulate-lanceolate, acute. *Petals* broadly oblong, rounded at the apex. *Lip* a little shorter than sepals and petals, 3-lobed, subpanduriform when flattened out, adnate by its base to the lateral sepals; basal lobes rounded, erect, white with reddish-purple branching veins, forming at the base a short conical sac; terminal lobe yellow with purplish veins terminating within the margin, oblong, with a rounded emarginate apex, the margins reflexed; disk with two prominent crenate lamellæ and a shorter interposed one, all three abruptly terminating within the margin of the apex. *Column* short, its foot slightly produced. *Anther* emarginate at the apex. *Pollinia* subglobose, attached to a short broad caudicle; gland conical.

Dehra Dun (Mackinnon); N. W. India (Falconer); Sub-Himalayan tracts of Rohilkhand and of the districts of Kheri and Gonda in N. Oudh (Duthie). Flowers in May. DISTRIB.: Outer Himalayan ranges of Garhwal, and in Nepal at Maghada in the Morung district (Buch-Hamilton). This plant was regarded by Sir J. Hooker as an anomalous species with the habit of an Australian *Dipodium*.

4. *E. Hormusjii*, Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 125, t. 109.

*Tuber* depressed, transversely oval, about 1½ in. across; *Pseudo-stem* about 4 in. long, bearing two tightly fitting sulcate subacute sheaths. *Leaves* two, developing later than the flowers, narrowly elliptic, acuminate, plicate. *Flowering stem* stout, 8-12 in. long, rising from the summit of the tuber, clothed at intervals with a few loose membranous lanceolate acuminate sheathing bracts. *Flowers* 8-10 forming a rather lax raceme about 3 in. long, and about 1 in. across, at first spreading, at length deflexed; floral bracts variable in length, lanceolate, acuminate, membranous, brownish. *Sepals* and *petals*

subequal in length, nearly  $\frac{1}{2}$  in. long, narrowly oblong or oblanceolate, acuminate or abruptly mucronate, white with pink veins and tinged with pale-green at the apex. *Lip* including spur a little longer than the sepals and petals; side-lobes deep-purple, erect, rounded, entire; between the side-lobes are three prominent whitish lamellæ; midlobe orbicular, yellow spotted with purple, and with a coarsely fimbriate disk, the margin undulate and irregularly erose. *Spur* cylindric, curved, obtuse, white, grooved in front. *Column* about half as long as the lip, with a very slightly produced foot. *Pollinia* oval, attached by a short stout caudicle to a shallow crescent-shaped gland.

Dehra Dun (Mackinnon); N. Oudh, in the Kheri district (Duthie). Flowers during April. **DISTRIB.** : Outer ranges of the W. Himalaya up to 5,000 ft. from Garhwal westwards to Hazara and the Chitral district, often in pine forests. This species is nearly related to *E. campestris*, differing chiefly by its shorter scapes, larger flowers and more congested racemes. The shape of the lip and the general colouring of the flowers are also very different. *E. campestris* is essentially a species of the plains, whereas *E. Hormusjii* extends up to the temperate region of the W. Himalaya where the climatic conditions are more favourable for leaf development.

5. *E. campestris*, Wall. *Cat.* 7367; *Royle Ill.* 366; *F. B. I.* vi, 4; *K. & P. in Ann. R. Bot. Gard. Calc.* viii, 178, t. 41; *Duthie id. ix, part 2*, 126; *Prain Beng. Pl.* 1016. *E. ramentacea* and *E. rupestris*, *Lindl.* *E. hemileuca*, *Lindl. in Journ. Linn. Soc.* iii (1859), 25. *Limodorum ramentaceum*, *Roxb.*; *Fl. Ind.* iii, 467. *Bletia Dabia*, *Don Prod.* 30.—*Vern. Sang-misri* (Beng.).

*Tubers* irregularly oblong, often lobed. *Leaves* two, rising from the apex of a slender sheathing pseudostem, developing long after the plant has flowered, 10-16 in. long, linear, acuminate, plicate. *Scape* 6-12 in. long, sheathed at intervals by loose membranous bracts; raceme laxly many-fld. *Flowers* drooping, subsecund, yellowish or green with pink or purple markings, about 1 in. across; floral bracts, membranous, linear or lanceolate, acuminate, usually longer than the slenderly stalked ovary. *Sepals* slightly attached to the base of the lip, linear-lanceolate, acute or acuminate, 5-7-nerved. *Petals* spreading, narrower than the sepals, oblanceolate, 3-5-nerved. *Lip* as long as the sepals, cuneate-ovate or oblong; side-lobes short, rounded or subacute, incurved round the column; midlobe orbicular quadrate or oblong, crenulate, usually purple; basal portion of disk with three median lamellæ ending in a fimbriate or tubercled patch on the terminal lobe. *Spur* short, conical subclavate or

subacute. *Column* as long as the lip, slender, without a foot. *Pollinia* broad; caudicle stout; gland elongate. *Capsule* in. long, ellipsoid. Sub-Himalayan tracts of Rohilkhand and N. Oudh (Wallich, Duthie). Flowers Mar. to May. DISTRIB.: Nepal, Sikkim, Chittagong, Bengal and Upper Burma, extending to Baluchistan and Afghanistan.

6. *E. nuda*, Lindl. in Wall. Cat. 7371; F. B. I. vi, 5; Hook. f. in Ann. R. Bot. Gard. Calc. v, 32, t. 47—50; K. & P. id. viii, 180, t. 243; Duthie id. ix, pt. 2, 127; Cooke Fl. Bomb. ii, 694.

Tuber large, spherical, smooth. Leaves 10-14 in long, rising from the side of a tuber and forming by their sheaths a short pseudo-stem, elliptic-lanceolate, acute, plicate, many-nerved, narrowed at the base into a long tubular sheath. Flowering stem stout, erect, firm, 2-3 ft. high, rising from the base of the pseudostem, with a few loose sheaths near the base and other more distant ones higher up. Racemes lax, about 1½ in. long, many-flld. Flowers usually pale-green or white with purple or pink or brownish markings; floral bracts lanceolate, acute, about half as long as the stalked ovary. Sepals about ½ in. long, erect, greenish-purple, linear-oblong, acute, 7-nerved; lateral pair slightly falcate, inserted on the spur of the lip, the dorsal one rather narrower. Spur very short, conical, obtuse, purplish-green, ribbed at the mouth. Petals shorter than the sepals, white, obtuse, many-nerved. Lip as long as the sepals, white or pale yellow flushed with pink or purple, oblong; side-lobes short, rounded; midlobe, oblong, obtuse, with a crisped margin; disk with about 9 strong prominent nerves. Column short, with a distinct foot, dilated at the margins. Anther small, its apex with two small conical processes and a third depressed one in front. Pollinia transversely oblong, attached by a broad caudicle to a shallow gland. Capsule 1½ in. long, fusi-form.

N. Oudh, in the districts of Kheri and Gonda (Duthie's Collector). Flowers April-June. DISTRIB.: Trop. Himalaya from Nepal eastwards to Sikkim; also in Chota Nagpur, Assam, Khasia Hills, Manipur and Burma, and south to Bombay Presidency and Ceylon.

7. *E. bicarinata*, Hook. f. in F. B. I. vi, 6; K. & P. in Ann. R. Bot. Gard. Calc. viii, 180, t. 244; Duthie id. ix, pt. 2, 127; Prain Beng. Pl. 1016. *Cyrtopera bicarinata*, Lindl.

Tuber about 2 in. long, compressed, irregularly lobed. Leaves usually undeveloped at the time of flowering, 7-12 in. long, linear, acuminate, narrowed below into the long petiole. Scape erect, 10-20 in. high, with two tubular inflated sheaths at the base and a few shorter ones.

higher up. *Racemes* 3-5 in. long, oblong, rather densely flowered. *Flowers* pale yellowish-green tinged with purplish-brown, 1 in. in diam.; floral bracts shorter than the stalked ovary, membranous, lanceolate. *Sepals* linear-oblong, acute, keeled, their edges reflexed and undulate; lateral pair inserted on the foot of the column, wider than the dorsal one and free from it at their bases. *Petals* narrowly elliptic, subacute, shorter and wider than the sepals. *Lip* adnate to the foot of the column, longer than the sepals, slightly saccate at the base, 3-lobed; side-lobes shallow, obtuse; veins reddish-purple, branching within the margin; terminal lobe tinged with yellow, transversely oblong, emarginate; disk with two short smooth ridges, half as long as the side-lobes and ending in a free triangular tooth, in front of which rise five unequal carunculate ridges extending to the terminal lobe. *Anther* apiculate in front. *Pollinia* broadly triangular, attached by a broad caudicle to a thin angular gland.

Sub-Himalayan tract in Pilibhit and in the Kheri district of N. Oudh (Duthie). Flowers in March and April. *DISTRIB.* : N. Bengal, Sikkim, Assam, Khasia Hills, Manipur and Upper Burma.

**S. E. flava**, *Hook. f. in F. B. I. vi, 7; Prain. Beng. Pl. 1016; Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 128, t. 170. Cyrtopera flava, Lindl. ; Royle Ill. 370, t. 88, fig. 1.*

A tall robust herb with a tuberous rhizome. *Leaves* about three-forming when young a short pseudostem by their sheathing base appearing later than the flowers, attaining 4 ft. in length and about 4 in. in width when fully developed. *Flowering stem* stout, unbranched, 2-5 ft. high, clothed at the base with a few distant close-fitting sheaths and rising from a tuber beside the leaf-bearing pseudostem. *Raceme* 1-2 ft. long, bracts much shorter than the ovary,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovate-lanceolate, acuminate. *Flowers* many, large, drooping, lemon-yellow. *Sepals* 1- $\frac{1}{4}$  in. long, oblong-lanceolate, acuminate. *Petals* rather shorter than the sepals and much broader, obtuse or emarginate, many-nerved. *Lip* equalling the sepals in length, 3-lobed; side-lobes large, rounded or oblong, whitish towards the apex and spotted with purple at their yellow bases; midlobe oblong, yellow, the disk with two small pyriform basal calli and three crenate lamellæ; spur a short blunt sac. *Column* about  $\frac{3}{4}$  in. long, produced at the base into a short foot. *Anther* emarginate at the apex and with a long anterior process. *Pollinia* obtusely angled, attached by a stout caudicle to a broad shallow gland.

Dehra Dun (Royle, Mackinnon); sub-Himalayan tracts of Rohilkhand and in the Kheri district of N. Oudh (Duthie). Flowers in June and July. *DISTRIB.* : Outer Himalayan ranges of Garhwal and

Kumaon to Nepal, up to 5,000 ft.; also in Chota Nagpur and Travancore, extending to Hongkong and China.

9. *E. obtusa*, Hook. f. in F. B. I. vi., 3; Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 129, t. 111. *E. campanulata*, Duthie in Journ. As. Soc. Beng. lxxi, part 2 (1902) 39. *Cyrtopera obtusa*, Lindl. Gen. and Sp. Orch. 190.

Height of plant 3-4 ft.; the leaves and scape rising from a horizontal oblong tuber. *Pseudostem* formed by the sheaths enclosing the bases of the leaves and scape. *Leaves* two or three, 12-18 in. long, linear, acuminate, plicate; veins sharply prominent. *Flowering stem* exceeding the leaves, with a few long tight-fitting acuminate sheaths towards the base. *Flowers* six to ten, in a lax raceme, appearing with the leaves,  $1\frac{1}{2}$  in. across, erect in bud, drooping and campanulate when open; floral bracts acuminate, less than half the length of the ovary. *Sepals* and *petals* prominently veined on the back, bright-yellow outside, pale-lemon within; dorsal sepal obovate, acute,  $\frac{1}{2}$  in. long; lateral pair rather shorter, falcately oblong, obtuse or subacute, adnate to the foot of the column. *Spur* short, curved subacute. *Petals* obovate, obtuse, about as long as the lateral sepals. *Lip* 3-lobed, longer than the sepals; side-lobes suborbicular, erect, whitish or pale-yellow, with lilac-coloured streaks at the base; midlobe bent upwards, the margin undulate. *Disk* with 5-8 prominent white ridges terminating within the margin of the apical lobe in a dull-yellow oblong grooved callus and prolonged towards the base into two sets of free fimbriate projections. *Column* about  $\frac{3}{8}$  in. long, oblong, narrowly winged curving forward into a distinct foot at the purple-streaked base. *Anther* with a rounded or slightly emarginate apex and a long anterior projection. *Pollinia* subglobose, attached by a cylindric caudicle to a crenulated obconical gland.

Dehra Dun, in swamps (W. Bell, Mackinnon, Duthie); Rohilkhand in the Pilibhit district, and at Chandanpur in the Gonda district of N. Oudh (Duthie's collector). Flowers during July and August.  
 DISTRIE.: Warm valleys in the vicinity of Mussoorie (Royle). After examining in the Royal Herbarium at Kew the single type specimen of Lindley's *Cyrtopera obtusa*, as well as Faloner's excellent drawing of the same plant under his manuscript name of *Eulophia arundinacea*, I had no hesitation in referring to it the *E. campanulata* which was described by me in the Journ. As. Soc. Beng. l.c. as a distinct species. Lindley was correct in his description of the column and its distinctly produced foot characteristic of the *Cyrtopera* section of the genus.

11. **GEDORUM**, Jackson; Fl. Brit. Ind. vi., 16.

Terrestrial herbs with underground subglobose rhizomes. *Leaves* elliptic, plicate, their sheaths forming a pseudostem. *Flowers* rather crowded, narrow, forming a decurved corymbose raceme on a stout sheathed scape arising from the base of the pseudostem. *Sepals* erect, equal, oblong, subacute. *Petals* as long as the sepals but broader and blunt. *Lip* sessile on the base of the column; side-lobes suppressed; terminal lobe broad, rounded, bifid or emarginate; disk with a forked basal callus. *Column* less than half the length of the lip. *Anther* broad, 2-celled; pollinia 2, broadly ovoid, attached by a slender tapering caudicle to a small orbicular gland.—Species about 9 or 10 in India, Malaya and Australia.

**G. dilatatum**, R. Br. in Ait. Hort. Kew ed. 2, v., 207; *Prain. Beng. Pl.* 1017; *Cooke Fl. Bomb.* ii., 695. *G. purpureum*, R. Br. l.c. *F. B. I.* vi., 16 (in part)-K. and P. in *Ann. R. Bot. Gard. Calc.* viii., 181, t. 245; *Duthie id. ix.*, part 2, 130. *Limodorum recurvum*, Roxb. *Fl. Ind.* iii., 469.

Tuber globose, apiculate,  $1\frac{1}{2}$  in. in diam. *Pseudo-stem* 3-6 in. long. *Leaves* 6-20 in. long, broadly elliptic, tapering at the base to a long sheath. *Flowers* about  $\frac{1}{2}$  in. long, pale-purple or rose-coloured, in racemes which are short corymbose and drooping when in flower, but elongate and erect in fruit; floral bract lanceolate, acute, exceeding the pedicelled ovary. *Sepals*  $\frac{3}{8}$  in. long, oblong, acute, 3-nerved, *Petals* as long as the sepals, oblong, obtuse. *Lip* pale-purple with darker markings,  $\frac{3}{8}$  in. long, ventricose at the base, and much thickened, subpandurate; side-lobes none; mid-lobe rounded, 2-fid. or emarginate; disk with a channelled ridge ending in raised yellow calli. *Pollinia* with elongate pits on their posterior surface.

Dehra Dun (Mackinnon). Flowers during June and July. *DISTRIB.:* Eastwards to Nepal, Sikkim and Bhutan; also in Assam, Bengal, Chota Nagpur, Burma, Malay Pen., Andaman Islands, extending to W. and S. India and Ceylon.

12. **CYMBIDIUM**, Swartz; Fl. Brit. Ind. vi., 8.

Epiphytes with a short stout pseudostem, rarely terrestrial or with an elongated leafy stem. *Leaves* coriaceous, usually long and

narrow, rarely rudimentary at the time of flowering. *Flowers* rather large, in many- or few-flowered suberect or drooping racemes, rarely 1-flowered; scape loosely sheathed; floral bracts various. *Sepals* and *petals* subequal, erect or spreading. *Lip* adnate to the base of the column and embracing it more or less by its convolute side-lobes; terminal lobe decurved; disk usually with two ridges. *Column* long, without a foot. *Anther* 1- or (imperfectly) 2-celled; *pollinia* 2, rarely 4, ovoid, pyriform cuneiform or subglobose, more or less partite, sessile on a small or large often strap-shaped gland.—Species about 50, in temperate subtropical and tropical Asia, a few in Africa and Australia.

A terrestrial almost leafless parasite;

*pollinia* 4 . . . . . 1. *C. macrorhizum*.

An epiphyte, with long strap-shaped

leaves; *pollinia* 2 . . . . . 2. *C. aloifolium*.

**1. *C. macrorhizum*.** Lindl. Gen. and Sp. Orch. 162; Royle Ill. 366; F. B. I., vi, 9; Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 134, t. 114.

A terrestrial almost leafless parasite. *Rootstock* as thick as a goose quill, creeping branched and jointed. *Scape* very short, basal sheath up to 2 in. long. *Raceme* up to 6 in. long, 6-8-flowered; floral bracts  $1\frac{1}{2}$  in. long. *Flowers*  $1\frac{1}{2}$  in. across; pedicel with ovary 1 in. long. *Sepals* about  $\frac{3}{4}$  in. long, linear-lanceolata, acuminate, pale-yellow, tinged with pink, spreading or reflexed. *Petals* shorter and broader than the sepals, whitish streaked with pink. *Lip* about  $\frac{3}{4}$  in. long, white with crimson or purple blotches along the margin; side-lobes narrow, erect, margins inflexed; midlobe oblong or subpan-duriform, acute at the apex; disk with two thick whitish ridges between the side-lobes. *Column* about  $\frac{3}{4}$  in. long, curved, inner surface streaked with crimson. *Anther* papillose outside. *Pollinia* 4, sessile on the crescent-shaped gland.

N. W. India (Royle, Falconer); Dehra Dun, Kalanga Hill (Mackinnon). Flowers during July and August. **DISTRIB.**: Outer Himalayan Ranges of Garhwal and Kumaon, up to 7,000 ft.; eastwards to Sikkim (but very rare); also in Assam and on the Khasia and Naga Hills. There is also a record of its having been found in Kashmir.

**2. *C. aloifolium*.** Swartz in Nov. Act. Upsal. vi, 73; Roxb. Fl. Ind. iii, 458; F. B. I. vi, 10; K. & P. Ann. R. Bot. Gard. Calc. viii, 198, t. 252; Duthie id. ix, part 2, 136; Cooke Fl. Bomb. ii, 696.

*Pseudostem* short. *Leaves* 12-18 in. long, linear-oblong, obtuse, fleshy, obliquely notched at the apex, slightly expanded at the sheathing base. *Inflorescence* shorter than the leaves; peduncle 3-4 in. long, bearing several tubular acute scarious sheaths near the base. *Flowers* yellowish-red, in many-flowered drooping racemes 9-15 in. long; floral bracts ovate,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; pedicels with ovary  $\frac{1}{2}$ - $\frac{3}{4}$  in. *Sepals* subequal, oblanceolate-oblong, obtuse; lateral pair subfalcate. *Petals* as long as sepals, obtuse. *Lip* purplish, equalling the sepals, 3-lobed, its upper surface with two stout lamellæ broken and disconnected in the middle; lateral lobes narrow, blunt, entire; midlobe ovate-oblong, decurved. *Column* slightly thickened at the apex. *Anther* subquadrate, papillose. *Pollinia* 2, small; gland crescent-shaped.

N. Oudh, in the Bahraich district (Duthie). Flowers during April and May. *DISTRIB.*: Nepal Terai and Trop. Himalaya eastwards to Sikkim and Assam; also in W. and S. India, extending to Ceylon, Tenasserim, the Andaman Islands and Malay Peninsula.

### 13. ORNITHOCHILUS, Wall.; Fl. Brit. Ind. vi, 76.

Epiphytic, without pseudobulbs. *Stem* very short. *Leaves* few, crowded, broadly oblong, softly coriaceous. *Inflorescence* supra-axillary, racemose or in panicles. *Sepals* subequal, spreading, incurved at the apex, lateral ones obliquely obovate. *Petals* smaller, cuneate-oblong, blunt. *Lip* much longer than sepals, adnate to foot of the column by a long broad claw with a rectangularly bent subcylindric spur at its junction with the terminal lobe; side-lobes shallow, subquadrate; terminal with three lobules; the two lateral recurved and pectinate; the central one triangular, entire or infolded; mouth of spur closed by two calli projecting from its back and front walls, the latter hairy. *Column* short, cylindric, with a short foot; rostellum short; stigma circular, surrounded by a hairy rim. *Anther* oblong; pollinia 2, subglobose caudicle broad, obtuse; gland large.—Species 1 or 2, Indian and Chinese.

**O. fuscus**, Wall. in Lindl. Gen. and Spec. Orch. 242; F. B. I. vi, 76; K. & P. in Ann. R. Bot. Gard. Calc., viii, 200, t. 268; Duthie id ix, part 2, 139.

*Leaves* 3-7 in. long, oblong or ovate-lanceolate, obliquely tapering to the acute apex and narrowed to the sessile sheathing base, fleshy,

shining on both surfaces when young: nerves inconspicuous. *Inflorescence* much longer than the leaves; racemes simple or sparingly branched; floral bracts lanceolate, much shorter than the long-pedicelled ovary. *Flowers*  $\frac{1}{2}$ -in. across. *Sepals* and *petals* greenish-yellow and streaked with red, the former with four, and the latter with two, broad brown vertical bands. *Lip* with two pectinate lobules, brown passing into purple. *Capsule* 1 in. long, fusiform.

Dehra Dun (Mackinnon), flowering in July. *DISTRIB.*: Outer Himalayan ranges of Garhwal and Kumaon up to 3,000 ft., extending eastwards to Sikkim, Bhutan, Khasia Hills, Burma and China.

**14. LUISIA, Gaud.**; Fl. Brit. Ind. vi, 22.

Epiphytes with rigid terete sheathed usually erect stems, woody below. *Leaves* terete, fleshy, distant, spreading. *Flowers* usually small and dull-coloured, in short extra-axillary spikes; rhachis stout; floral bracts short, scarious persistent. *Sepals* subequal, or the decurved dorsal one smaller. *Petals* equalling the sepals or much longer, spreading. *Lip* sessile on the base of the column, divided into two parts, basal portion (hypochile) concave or flat; apical portion (epichile) decurved, broad and ridged, entire or crenate or undulate and with a more or less blunt apex. *Column* stout, much shorter than the lip; stigma usually large. *Anther* broad, 2-celled; pollinia 2, ovoid or subglobose, attached by a broad caudicle to a subquadrate or elongate gland. *Capsule* suberect narrow, ridged.—Species about 15, chiefly in Tropical Asia, a few in Australia.

**L. trichorhiza**, Blume Mus. Bot. Lugd. Bat. i, 63; F.B.I. vi, 23; K. & P. in Ann. R. Bot. Calc. viii, 202, t. 270; Duthie id. ix, part 2, 140.

*Stem* 4-9 in. long, very stout, not branched. *Leaves* fleshy, 4-6 in. long and about  $\frac{1}{2}$  in. thick, slightly tapering to the apex. *Spikes* stout, 4 or 5-flowered. *Flowers*  $\frac{1}{2}$  in. long, on short thick tubercles; flowering bracts broad, acuminate, persistent. *Sepals* unequal, green with faint purple lines; dorsal sepal oblong, blunt; lateral pair shorter, obliquely ovate, acute, keeled. *Petals* longer and narrower than the lateral sepals, oblong, blunt, all spreading. *Lip* longer than sepals, dull purple on a greenish ground; basal portion (hypochile) deeply concave and with erect rounded edges; epichile broadly cordate and tapering to the subtruncate emarginate apex; upper

surface with short blunt vertical ridges. *Column* stout, half as long as the lip, purple. *Anther* subquadrate, compressed. *Rostellum* broad. *Pollinia* ovoid, attached by a broad caudicle to the quadrate gland.

Dehra Dun, epiphytic chiefly on sal trees (Gamble, Mackinnon). Flowers during March and April. *DISTRIB.*: Tropical Himalayan Valleys from Garhwal to Sikkim. It occurs also in Chota Nagpur.

15. *ÆRIDES*, Lour.; *Fl. Brit. Ind.* vi, 43.

Epiphytes with leafy stems; pseudobulbs none. *Leaves* lorate rarely terete. *Flowers* usually many and showy, in dense or lax decurved racemes, sometimes solitary; floral bracts minute. *Sepals* broad, spreading; lateral ones adnate to the base or foot of the column. *Petals* like the sepals. *Lip* adnate to the column, spurred; side-lobes large or small or none; midlobe longer than the side-lobes or smaller and incurved between them. *Column* short with a short or long foot. *Anther* 2-celled, beaked or not; *pollinia* 2, globose, silicate; caudicle long or short; gland various.—Species about 20, in E. Asia.

Terminal lobe of lip large, hastate-ovate; flowers pink with purple spots . . . . 1. *Æ. multiflorum*.

Terminal lobe of lip small, linear or narrowly oblong; flowers white, spotted with lilac, very fragrant . . . . 2. *Æ. odoratum*.

1. *Æ. multiflorum*, Roxb. *Cor. Pl.* iii, 63, t. 271; *Fl. Ind.* iii, 475; *F. B. I.* vi, 44; *K. & P. in Ann. R. Bot. Gard. Calc.* viii, 212, t. 283; *Duthie id. ix, part 2*, 142; *Prain Beng. Pl.* 1020.

*Stem* stout, 4-10 in. long. *Leaves* 6-8 in. long, narrowly oblong, conduplicate, recurved, slightly tapering to the oblique bifid apex, not narrowed to the base, often tinged with red. *Racemes* longer than the leaves, simple, axillary, densely many-flowered; peduncle long, clothed with short distant sheaths. *Flowers*  $\frac{3}{4}$ -1 in. across, deep-pink and with darker spots. *Sepals* and *petals* about equal, oblong, blunt. *Lip* twice as long as the sepals, triangular, adnate to the base of the column, acute or obtuse at the apex, margins erose; basal portion thick and with a retrorse tooth or callus across the mouth of the short rectangularly bent spur. *Column* with a short foot, its margins thickened and slightly winged near the base.

*Anther* depressed and with a long curved beak in front. *Pollinia* globular, caudicle filiform, gland narrow. *Capsule* up to 2 in. long subclavate, stoutly pedicelled.

Dehra Dun and Siwalik range, common on mango trees. Flowers during June and July. *DISTRIB.* : Outer ranges of Himalaya from Kangra to Nepal and Sikkim, up to about 4,000 ft. ; also found in Assam, Chota Nagpur and N. Bengal.

2. *A. odoratum*, Lour. *Fl. Cochin.* 525 ; *F. B. I.* vi, 47 ; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 212, t. 282 ; *Duthie id. ix cart* 2, 143 ; *Prain Beng. Pl.* 1020 ; *Cooke Fl. Bomb.* ii, 701. *A. ornatum*, Roxb. ; *Fl. Ind.* iii, 272.

*Stem* 4-12 in. long, very stout. *Leaves* 6-12 in. long and 1-1½ in. wide oblong, flat, keeled, tapering slightly to the blunt unequally bilobed apex, not contracted at the sheathing base. *Racemes* supra-axillary, deflexed, as long as or longer than the leaves, many-flowered ; *peduncle* short, stout, with short distant sheaths. *Flowers* about 1 in. long, white, spotted with pink, fragrant ; *floral bract* broad, sheathing, blunt, much shorter than the stalked ovary. *Sepals* unequal, obtuse, spreading, the dorsal one elliptic-ovate, the lateral pair larger. *Petals* oblong, falcate, shorter than sepals. *Lip* adnate to the short foot of column ; side-lobes larger than the incurved almost linear emarginate midlobe. *Anther* triangular, depressed, beaked. *Pollinia* globose, caudicle linear, gland quadrate. *Capsule* about 1½ in. long, fusiform.

Dehra Dun (King, Gamble, Mackinnon) ; N. Oudh, in the Bahraich district (Duthie). Flowers during July and August. *DISTRIB.* : Trop. Himalaya in Garhwal and Kumaon and eastwards to Nepal and Sikkim ; also in E. Bengal, Chota Nagpur and the Circars ; extending to Tenasserim, Malaya and China.

#### 16. *RHYNCHOSTYLIS*, Blume ; *Fl. Brit. Ind.* vi, 32.

Epiphytes, without pseudobulbs. *Stems* elongate, stout, leafy. *Leaves* very coriaceous, linear-oblong, truncately or bluntly 2-lobed at the apex. *Flowers* in long drooping densely cylindric racemes, showy. *Sepals* spreading, broad, obtuse. *Petals* similar to the sepals but narrower. *Lip* adnate to the short foot of the column, the hypochile forming a deep wide pubescent sac without side-lobes ; epichile obovate, acute, concave with erect margins. *Column* short, stout, dilated at the base and with a very short

foot; stigma small. *Anter* terminal, rounded; pollinia 2, elliptic, attached by a long slender caudicle to a small oblong gland.—Species 2 or 3, Indian and Malayan.

**R. retusa**, Blume *Bijdr.* 286, t. 49; *F. B. I.* vi, 32; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 213, t. 284; *Duthie id. ix, part 2*, 143; *Prain Beng. Pl.* 1020; *Cooke Fl. Bomb.* ii, 698. *Saccolabium guttatum*, *Lindl.*; *Royle Ill.* 366. *Ærides guttatum*, *Roxb. Fl. Ind.* iii, 471. *Epidendrum retusum*, *Linn.*

Stems stout, 3-8 in. long, clothed with the sheaths of decayed leaves and emitting many stout branching roots. Leaves 6-18 in. long and  $\frac{1}{2}$ - $1\frac{1}{2}$  in. wide, strap-shaped, spreading and recurved, obliquely premorse or bluntly and unequally 2-lobed at the apex. Racemes dense, cylindric, longer than the leaves. Flowers about  $\frac{3}{4}$  in. across, white or pale-pink, dotted with darker-coloured spots; bracts  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, ovate, acute, persistent. Sepals veined, about  $\frac{1}{2}$  in. long; lateral pair obliquely obovate-orbicular; dorsal one obovate, rounded. Petals as long as the sepals, elliptic-oblong, subobtuse. Lip dark-pink, with a saccate flattened spur; epichile variable in shape,  $\frac{1}{3}$  in. long, oblong or cuneate-oblong at the base, widening towards the apex. Capsule 1- $1\frac{1}{2}$  in. long, acutely 3-angled and 6-ribbed, its pedicel short and stout.

Dehra Dun (King, Mackinnon, etc.); Siwalik range (Royle); N. Oudh, in the Gonda district (Duthie). Flowers during June and July. DISTRIB. : Trop. Himalaya from the Punjab eastwards to Nepal, Sikkim and Bhutan, up to 4,000 ft., also in Assam, the Khasia Hills, Chota Nagpur, Konkan and Kanara; extending to Burma, S. India, Ceylon and the Malay Islands.

#### 17. VANDA. R. Br.; Fl. Brit. Ind. vi, 49.

Epiphytes with leafy stems. Leaves thickly coriaceous or fleshy, flat and keeled or terete. Flowers usually large and often showy, in simple lax or dense racemes, sometimes solitary; floral bracts much shorter than the ovary. Sepals and petals subequal, spreading or connivent, narrowed at the base. Lip large, usually saccate or spurred at the base; side-lobes large or small, rarely absent, adnate to the short foot of the column or to the sides of the sac or spur; midlobe fleshy, various; disk usually ridged or amellate, sometimes carunculate. Column short, stout, the foot

short or none. *Anther* 2-celled; rostellum small; pollinia 2, didymous, subglobose or obovoid; caudicle short and broad or long and geniculate; gland usually large. Species about 20, in Tropical Asia and Australia.

Sepals and petals spreading:—

Flowers small, less than 1 in. across, yellow except the bluish caruncles on the lip . . . . 1. *V. parviflora*.

Flowers 1½-2 in. across; sepals and petals greenish-yellow mottled with brown; mid lobe of lip with purple caruncles . . . . . 2. *V. Roxburghii*.

Sepals and petals incurved . . . . . 3. *V. cristata*.

1. *V. parviflora*, Lindl. in Bot. Reg. xxx (1844) Misc. 45; F. B. I. vi, 50; K. & P. Ann. R. Bot. Gard. Calc. viii, 215, t. 286; Duthie id. ix, part 2, 144; Prain Beng. Pl. 1021; Cooke Fl. Bomb. ii, 703.

Stem stout, 3-6 in. long, enveloped in the sheathing bases of fallen leaves. Leaves 3-8 in. long by  $\frac{3}{4}$ -1 in. wide (when flattened out), linear-oblong, conduplicate, keeled, unequally and obtusely 2-lobed at the apex. Inflorescence from below the leaves and about as long; peduncle as long as the raceme, bearing a few small scattered sheaths. Raceme few-flowered; floral bracts ovate, acute, deciduous. Flowers yellow except the blue fleshy ridges on the lip, less than  $\frac{3}{4}$  in. across. Sepals and petals spreading. Sepals spathulate, obtuse; the lateral pair shorter than the dorsal one. Petals as long as the lateral sepals, falcately spathulate-oblong, falcate. Lip  $\frac{1}{2}$  in. long, adnate to the short foot of the column, spurred; side-lobes erect, oblong, rounded, rising from the mouth of the spur; midlobe fleshy, obovoid; tip dilated, crenulated; disk with two broad bluish ridges. Column short, with a short thick foot. Anther depressed, slightly beaked in front. Pollinia subglobose, attached to a short broad caudicle. Capsule 1-1½ in. long, fusiform, with winged ridges.

Dehra Dun (Mackinnon). Flowers May and July. DISTRIB.: Outer ranges of Himalaya, up to 4,000 ft., from Garhwal eastwards to Nepal and Sikkim; extending to Assam and Burma; also in Chota Nagpur, the Konkan and S. India to Ceylon.

2. *V. Roxburghii*, R. Br. in Bot. Reg. t. 506; F. B. I. vi, 52; Watt, E. D.; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 145, t. 116; Prain Beng. Pl. 1021; Cooke Fl. Bomb. ii, 704. Cymbidium

*tessallatum*, Sw.; *Roxb. Fl. Ind.* iii, 462. *C. tessalloides*, *Roxb. l. c. 463*.—*Vern. Rasna, nai.*

Stem climbing, 1-2 ft. long, emitting many thick white fleshy roots.

*Leaves* bifarious, approximate, 6-8 in. long, narrow, complicate, keeled; apex praemorse. *Racemes* longer than the leaves; peduncle 6-10 in. long. *Flowers* 1½-2 in. across. *Sepals* and *petals* subequal, spreading, clawed, obovate, undulate, yellowish (rarely bluish), tessellated with brown, their claws and outer surfaces white. *Lip* ½ in. long, bluish streaked with purple; side-lobes small, acute, rising from the mouth of the spur, ¼ in. long, ovate, acute, erect; terminal lobe panduriform, with a purple dilated truncate 2-lobed apex, the margins deflexed; disk convex, with fleshy ridges; spur conical, obtuse, straight, hairy within. *Column* very short. *Capsule* 3-3½ in. long, shortly stalked, clavate, sharply ridged.

Forests of Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh (R. Thompson, Duthie). Often climbing on the branches of mango trees and *Bassia latifolia* (mahua). Flowers during the rains. *DISTRIB.*: Konkan, Gujarat and Kanara in the Bombay Pres.; also in Bengal, Behar, Chota Nagpur and Central Provs., extending south to Travancore and Ceylon. The roots are used medicinally in the Chânda district of C. Provinces for rheumatism and fever, and for allaying the pain caused by the stings of scorpions.

**3. *V. cristata*, Lindl. in Wall. Cat. 7328; F. B. I. vi, 53; K. & P. Ann. R. Bot. Gard. Calcutta, viii, 216, t. 287; Duthie id. ix, part 2, 146.**

Stem 3-6 in. long, clothed with the remains of old leaf-sheaths. *Leaves* bifarious, crowded, 3-4 in. long, conduplicate, unequally bilobed at the truncate apex, dilated at the sheathed base. *Raceme* not exceeding the leaves, axillary, 2-5-fld. *Flowers* 1½-2 in. across. *Sepals* and *petals* incurved, pale olive-green or yellowish. *Sepals* unequal, oblong, obtuse. *Petals* narrower than sepals, oblong. *Lip* adnate to base of column, longer than sepals, green blotched with dull purplish-brown; basal lobes erect, triangular; terminal lobe yellow streaked with purple, oblong, with two divaricate oblong lobules and a horn-like, deflexed fleshy beak; upper-surface with five carunculate ridges. *Spur* short, conical, obtuse. *Column* short, without a foot. *Pollinia* ovoid, attached by a short broad caudicle to a large quadrate gland. *Capsule* narrowly clavate, 2-2½ in. long.

Dehra Dun (Mackinnon). Flowers during May. *DISTRIB.*: Outer ranges of Himalaya in Garhwal and Kumaon, up to 4,000 ft.; extending eastwards to Sikkim, Bhutan and Sylhet.

## 18. SACCOLABIUM, Blume; Fl. Brit. Ind. vi, 54.

Epiphytes, without pseudobulbs. *Leaves* coriaceous, flat or conduplicate, often keeled. *Flowers* usually small, in leaf-opposed or supra-axillary racemes corymbs umbels or panicles; floral bracts minute. *Sepals* and *petals* adnate to the column, subequal, spreading or reflexed. *Lip* sessile on the footless column, forming a cylindric or saccate spur; lateral lobes small or none; terminal one small, often hairy. *Anther* 1- or imperfectly 2-celled; pollinia 2, entire or bipartite.—Species 50, in E. Asia.

Spur cylindric, straight . . . . . 1. *S. papillosum*.  
 Spur short, at right angles to the ovary, widely saccate :—  
 Apex of leaves not setulose; terminal lobe of lip papillose-hairy . . . . . 2. *S. calceolare*.  
 Apex of leaves setulose; terminal lobe of lip fleshy and glabrous . . . . . 3. *S. distichum*.

1. *S. papillosum*, Lindl. in Bot. Reg. t. 1552 (excl. syn.); F. B. I. vi, 63; K. & P. Ann. R. Bot. Gard. Calc. viii, 219, t. 290; Duthie *ed.* ix, part 2, 147; Prain Beng. Pl. 1022.

Stems 2-3 ft., stout, erect, clustered, bearing many nearly horizontal leaves. *Leaves* coriaceous, 3-4 in. long, conduplicate, curved; apex truncate or deeply notched. *Peduncle* 1-2 in. long, leaf-opposed, about  $\frac{1}{4}$  in. long, bearing a subcorymbose 4-8-flowered raceme. *Flowers*  $\frac{1}{2}$  in. in. diam; bracts triangular. *Sepals* and *petals* yellow barred and blotched with brown. *Sepals* subequal, oblong, subacute, spreading. *Petals* narrower than *sepals*, subspathulate. *Lip* longer than *sepals*, adnate to the base of the column; side-lobes none; terminal lobe decurved, ovate-oblong, obtuse, crenate; upper surface transversely rugulose, white with transverse purple bars. *Spur* cylindric, straight, half as long as the ovary and parallel to it, cylindric or slightly tapering, pale-yellow, hairy within. *Column* short. *Anther* broadly conical. *Pollinia* subovoid, deeply bipartite; caudicle slender, tapering to the small oblong gland. *Capsule*  $1\frac{1}{4}$  in. long, fusiform, ridged.

Dehra Dun, in swamps (Gamble, Mackinnon). DISTRIB.: Outer ranges of Himalaya in Garhwal and Kumaon and eastwards to Sikkim; also in Assam, Bengal, Circars and Burma.

2. *S. calceolare*, Lindl. in *Wall. Cat.* 7302; *F. B. I.* vi. 60; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 225, t. 300; *Duthie id. ix*, part 2, 147. *Gastrochilus calceolaris*, *Don Prod.* 32.

Stem short, pendulous. Leaves 4-10 in. long, narrowly oblong, unequally bifid at the apex, slightly narrowed towards the base. Racemes much shorter than the leaves, corymbose, many-flowered; peduncle stout, bearing several short sheaths. Flowers crowded,  $\frac{2}{3}$  in. across; floral bracts small, broad and blunt. Sepals and petals pale-green with large brownish spots. Sepals unequal, spreading, the dorsal one obovate-oblong; lateral pair falcately oblong, narrower. Petals shorter than the sepals, oblong-obovate. Lip adnate to the lower half of the column, the base forming a short wide yellow sac about half as long as the ovary; side-lobes none; terminal lobe at right-angles to the sac, semicircular; its upper surface, except a triangular yellow patch at the base, pure white and covered with hair-like papillæ. Column very short and thick. Anther depressed, shortly beaked. Pollinia broadly ovoid-elliptic, attached by a slender caudicle to a small cordate gland.

Dehra Dun (Mackinnon). Flowers in April and May. DISTRIB.: Outer Himalayan ranges from Garhwal eastwards to Sikkim and Bhutan; also on the Khasia Hills, extending to Burma and the Malay Peninsula.

3. *S. distichnum*, Lindl. in *Journ. Linn. Soc.* iii, 4; *F. B. I.* vi, 64; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 227, t. 303; *Duthie id. ix*, part 2, 148.

Stems pendulous, 5-10 in. long, branching, slender, leafy. Leaves  $\frac{1}{2}$ -1 in. long, narrowly lanceolate, acuminate, with two or three fine setæ from the apex; base sessile and slightly oblique. Peduncles leaf-opposed, about equalling the leaves in length. Flowers 2-4, in a lax raceme, about  $\frac{1}{2}$  in. in diam., green, irregularly spotted with brown; floral bracts oblong, subacute. Sepals and petals subequal, oblong, elliptic, obtuse. Lip about as long as the petals, adnate to lower half of column, the base with a wide blunt sac at right angles to the ovary, its inner surface without hairs or calli; side-lobes none; terminal lobe yellow, semicircular, entire, smooth, fleshy; margins deflexed, the base with two blunt conical calli. Column short, broad. Anther shortly beaked in front. Pollinia elliptic; caudicle long, slender, cylindric, the gland elongate, bifid. Capsule fusiform, about  $\frac{2}{3}$  in. long.

Northern Oudh, in the Bahraich district (Duthie's collector). Flowers during April and May. DISTRIB.: Outer Himalayan ranges in

Garhwal, up to 6,000 ft., and eastwards to Sikkim, the Khasia Hills and Manipur.

19. **CLEISOSTOMA**, Blume; included under *Saccolabium* in  
Fl. Brit. Ind. vi, 59.

Epiphytic herbs. *Stems* more or less elongate. *Leaves* coriaceous or fleshy, flat or semiterete. *Flowers* in leaf-opposed racemes or panicles. *Sepals* adnate to the column, subequal, spreading. *Petals* like the sepals. *Lip* sessile on the footless column, the base with a large saccate or funnel-shaped spur which is sometimes dilated at the apex; its opening more or less occluded by 2 calli, the posterior of which is frequently 2-fid., and also sometimes by a dorsal scale, but never septate; the lateral lobes small or obsolete; apical lobe thickened, concave. *Column* short, thick, footless. *Anther* depressed; pollinia 2, often 2-fid.; caudicle single.—Species about 40 in. E. Trop. Asia and Australia.

**C. micranthum**, K. & P. Ann. R. Bot. Gard. Calc. viii, 234, t. 312; Duthie id. ix, part 2, 148; Prain Beng. Pl. 1023. *Saccolabium micranthum*, Lindl.; F. B. I. vi, 59.

*Stem* stout, compressed, 3-8 in. long, enveloped in the leaf-sheaths. *Leaves*  $2\frac{1}{2}$ - $3\frac{1}{2}$  in. long, narrowly oblong, keeled, obliquely truncate, obtusely bifid, tapering to the shortly sheathed base. *Flowering stem* equalling or longer than the leaves; racemes many-flowered; peduncle and rachis stout. *Flowers* about  $\frac{1}{2}$  in. across; bracts broad, blunt, much shorter than the short sessile ovary. *Sepals* and *petals* spreading, white with large purple spots. *Sepals* broadly ovate, obtuse. *Petals* smaller than the sepals, oblong. *Lip* fleshy, pink or purple, as long as the sepals. *Spur* addressed to and as long as the ovary, wide, blunt; lateral lobes of lip small; terminal one convex, oblong, blunt, margins thin, erose; upper surface smooth. *Column* very short and stout, with a large protuberance on either side of the rostellum. *Anther* with a long pointed beak. *Pollinia* obovoid; caudicle triangular, shallowly cordate, attached to a small orbicular gland.

Dehra Dun (Vicary, Mackinnon). Flowers during June and July. DISTRIB.: Outer ranges of Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan, Assam, and on the Naga and Khasia Hills; also in Chota Nagpur and in Tenasserim.

20. **SARCANTHUS.** Lindl.; Fl. Brit. Ind. vi, 66.

Epiphytic herbs, with usually elongate stems. *Leaves* fleshy, terete or flat. *Flowers* in extra-axillary racemes or panicles. *Sepals* subequal, spreading or reflexed, or the dorsal one concave and connivent over the column. *Petals* smaller than the sepals, spreading. *Lip* adnate to the base of the column, or to its foot, rarely jointed, the base with a funnel-shaped spur sometimes dilated at its apex, the opening more or less occluded by calli on its anterior and posterior walls, and always divided into two lateral compartments by a vertical antero-posterior septum; lateral lobes small more or less triangular and acute; apical lobe small, triangular or hastate. *Column* short, stout, often with a foot as long as or longer than itself. *Anther* depressed; *pollinia* 2, bifid.—Species about 35, in E. Trop. Asia.

**S. insectifer.** Reicht. f. in Bot. Zeit. 159; F. B. I. vi, 68; Duthie Ann. R. Bot. Card. Calc. ix, part 2, 149; Prain Beng. Pl. 1023.

*Stem* 1 ft. or more in length, robust, scandent, flexuous, emitting many elongate fibres. *Leaves* firmly coriaceous, crowded, almost imbricate,  $\frac{1}{2}$ -2 in. long, distichously spreading, oblong, amplexicaul, apex obtusely 2-lobed. *Racemes* shorter than the leaves, subsessile, few-flowered, decurved; rhachis stout; bracts minute, deciduous. *Flowers* about  $\frac{1}{2}$  in. across; sepals and petals 3-nerved, yellowish-green, striated with red. *Sepals* ovate-oblong, obtuse or subacute. *Petals* oblong. *Lip* white and pink, or purple; side-lobes short; terminal lobe larger than the sepals, triangular-ovate or cordate. *Spur* vertically septate, its mouth with a pubescent ridge. *Column* very short. *Anther* hemispheric. *Pollinia* sulcate, attached to a short caudicle broader than long; gland transverse, membranous.

N. Oudh, in the Bahraich district (Duthie). Flowers in Sep. DISTRIB.: Garhwál, in the Rámganga valley, also in Chota Nagpur, Behar, Cachar, Chittagong, Sundribans, extending to Tenasserim.

21. **POGONIA.** Juss.; Fl. Brit. Ind. vi, 118.

Terrestrial unifoliolate tuberous-rooted herbs; tuber stoloniferous, each stolon bearing at its tip a tuber smaller than that of the parent. *Leaf* broadly cordate or orbicular, strongly plicate, rising from the same tuber as the flowers, but usually after the

appearance of the flower-scape, occasionally coetaneous. *Flowers* solitary few or several, racemose, often pendulous, on scapes rising from the tuber. *Sepals* subequal, narrow, connivent or spreading. *Petals* like the sepals. *Lip* adnate to the base of the column, sometimes slightly saccate at the base, rather narrow, the lower portion convolute round the column; lateral lobes small, usually triangular; apical lobe flat, ovate or orbicular, entire, or fimbriate. *Column* elongate, clavate upwards; stigma anticus, oblong or orbicular. *Anter* more or less incumbent, substipitate; pollinia 2 or 4, elongate, powdery, often coherent, without caudicle or gland. Species about 80, in Trop. Asia, America and Africa.—The above characters apply only to the section *Nervilea*, to which all the Old World species of *Pogonia* belong, and which differ by flowering before the leaves appear. All the other species, except one in Japan, are found in the New World, and their flowering stems bear leaves.

Leaves many-nerved; floral bracts longer than ovary, deflexed; lip slightly saccate at the base . . . . .

1. P. GAMMIEANA.

Leaves 7-9-nerved; floral bracts erect; lip not saccate at the base . . . . .

2. P. CARINATA.

1. **P. Gammieana**, *Hook. f. in Bot. Mag. t. 6671*; *F. B. I. VI*, 120; *K. & P. Ann. R. Bot. Gard. Calc. viii*, 269, *t. 359*; *Duthie id. ix*, part 2, 158.

Tuber globular warted, about  $1\frac{1}{2}$  in. in diam. Leaf glabrous, 5-6 in. across, reniform, abruptly acuminate, many-nerved, its margin much undulate; petiole about as long as the blade, sheathed at the base. Flowering stem stout, 3-12 in. long, peduncle bearing two or three long tubular acute and often bifid bracts. Raceme laxly 5-8 fid. Flowers about 1 in. long, drooping, pink streaked with white; floral bracts deflexed, longer than the truncate stalked ovary, linear-lanceolate, acuminate. Sepals and petals subequal, ob lanceolate, connivent. Lip pale-green, as long as the sepals, saccate at the base, elliptic-obovate (when spread out); lower half convolute and with two short side-lobes pointing forwards; epichile spreading, the margin deeply crenulate; disk hairy, with three parallel central ridges.

Dehra Dun (Mackinnon, Duthie); Siwalik range, in the Timli Pass (Duthie). Flowers in May, and the leaves appear about two months later. DISTRIB.: Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft.; also in Sikkim.

**2. P. carinata.** Lindl. *Gen. & Spec. Orch.* 414; *F. B. I.* vi, 121; *Prain Beng. Pl.* 1026; *Duthie Ann. R. Bot. Gard. Calc.* ix, part 2, 159, t. 124; *Cooke Fl. Bomb.* ii, 707. *Epipactis carinata*, Roxb. *Fl. Ind.* iii, 454.

*Tubers* globose or obovate,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., annulated and warted. *Leaf*  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. wide, ovate, acute or cuspidate, cordate or cuneate at the base, 7-9-nerved, glabrous; petiole 1-2 in. long, sheathed at the base. *Flowering stem* up to 1 ft. high, bearing 3 or 4 loose tubular acute or acuminate sheaths. *Raceme* laxly flowered; floral bracts twice as long as the stalked ovary, erect lanceolate, acuminate, 5-nerved. *Flowers* about 1 in. long. *Sepals* and *petals*, sub-equal, spreading, linear-lanceolate, acuminate, green. *Lip*  $\frac{3}{4}$  in. long, straight, trough-shaped, not saccate at the base, 3-lobed above the middle, white tinged with yellowish green and with conspicuous pink-coloured veins usually bifurcating within the margin; upper surface hairy especially on the ridges and veins; side-lobes erect, margins entire, terminal lobe not deflexed, ovate, bluntly acuminate, its margin irregularly crenulate. *Column*  $\frac{1}{4}$  in., slightly curved, dilated at the apex. *Anther* triangular, beaked in front.

Sub-Himalayan tracts of Rohilkhand and North Oudh, in the districts of Pilibhit, Bahraich and Gonda. Flowers in May, the leaves appearing about one month later. *DISTRIB.*: Ramganga valley in Kumaon (T. Thomson); common in Bengal and eastwards to Burma; also in the Bombay Pres. and southwards to S. India.

**22. EPIPACTIS.** Andans.; *Fl. Brit. Ind.* vi, 125.

Terrestrial herbs with fibrous roots and leafy stems. *Leaves* sessile, plicate. *Flowers* in racemes, drooping; floral bracts elongating and often leaf-like. *Sepals* and *petals* broadly lanceolate, acuminate, strongly nerved. *Lip* adnate to the base of column, distinctly divided into hypochile and epichile; hypochile much deflexed, concave or saccate, jointed to the epichile at a right angle, both with entire edges. *Column* short; stigma large, anticus; rostellum broad, prominent. *Anthers* erect, obtuse, its cells contiguous; pollinia 2, bipartite, very narrow. Species about 12, in the North Temp. Hemisphere.

**E. consimilis.** Wall. *Cat.* 7043 (not of Don); *F. B. I.* vi, 126; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 272, t. 364; *Duthie id.* ix, part 2, 161; *Collett Fl. Siml.* 498.

Height of plant 1-2 ft. *Stem* leafy, slender, glabrous. *Leaves* 4-7 in. long, lanceolate, acuminate; uppermost shorter and much narrower; nerves prominent. *Raceme* 4-6 in. long, laxly fld., rhachis tomentose. *Flowers* 1-1½ in. across; flowering bracts ovate or linear-lanceolate, varying in size. *Sepals* spreading, unequal, concave, clothed with white hairs on a deep-lavender ground, green inside as are both surfaces of the petals, and marked with broad bands of reddish-brown; dorsal sepal lanceolate, acute; lateral pair much broader. *Petals* ovate, acute, tomentose on the stout midrib beneath. *Lip* rather shorter than the sepals; hypochile purple, trough-shaped, bearing granular unequal calli inside, with two larger obtuse nectar-exuding ones near the apex; epichile pale brown, lanceolate and with erect lobes; upper surface with a median ridge terminating within the white apex. *Column* stout, curved; stigmas large, subrotund and with two glands on the lower margin. *Anther* tumid.

Dehra Dun (Gamble, Mackinnon); banks of canal near Saharanpur (Duthie). Flowers during Feb. and March. *DISTRIB.* : W. Himalaya from the Simla Hills to Kumaon, up to 3,000 ft. and eastwards to Nepal and Sikkim, extending to upper Burma and China; it is found also on the N. W. frontier of India in the districts of Gilgit and Chitral, and extends to Afghanistan and Syria.

23. **GOODYERA**, R. Br.; *Fl. Brit Ind*, vi, 110.

Terrestrial leafy herbs; stem decumbent below. *Leaves* usually rather thick, with wide sheaths and often distinct petioles. *Flowers* small, numerous, in terminal, sometimes secund, spikes or racemes. *Sepals* subequal, often pubescent outside; lateral pair free, subconnivent or spreading; dorsal concave. *Petals* like the dorsal sepal and forming with it a hood over the column. *Lip* adnate to base of column, entire saccate or cymbiform at the base; apical lobe small, usually acute and decurved; basal sac with setæ calli or ridges inside, rarely smooth. *Column* short, with projecting rostellum; stigma anticus, undivided. *Anther* usually pyriform, with a long erect beak; pollinia 2, clavate, sessile on a large or small gland.—Species about 25, in Europe, Temp. and Trop. Asia, North America, New Caledonia and the Maserene Islands.

**G. procera**, Hook, *Exot. Flora*, t. 39; Don Prod. 28; Royle Ill. 384; F. B. I. vi, 111; K. & P. Ann. R. Bot. Gard. Calc. viii, 282, t. 378; Duthie id. ix, part 2, 165; Frain Beng. Pl. 1027.

*Stem* 10-30 in. in length, very leafy below, glabrous, loosely enveloped by the wide leaf-sheaths. *Leaves* many, long-petioled; blade 4-8 in. long, elliptic or ovate-elliptic, tapering at each end, acute or acuminate; petiole stout, 1½-3 in. long. *Peduncle* bearing many lanceolate acuminate bracts which are hairy above and glabrous beneath. *Spike* 3-8 in. long, many-and densely fld.; rhachis pubescent. *Flowers* minute, subglobose, white tinged with green; fl. bract as long as ovary, ovate-lanceolate, acuminate, pubescent on the margin. *Sepal* glabrous, subequal, broadly ovate, obtuse. *Petals* clawed, cuneately obovate. *Lip* longer than sepals, with a large saccate base, its apex decurved, triangular, entire; interior of basal sac with two rows of long setæ on the sides and an oblong callus at the apex of each row. *Column* very short, with a transverse depression below the broad anticus stigma. *Anther* pyriform, obtuse. *Pollinia* clavate-cylindric, sessile on a small oblong gland.

Dehra Dun (Mackinnon); N. Oudh in the Bahrach district (Duthie). Flowers in May. *DISTRIB.*: Outer Himalayan ranges of Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim and Bhutan; also in Assam and on the Khasia and Naga Hills; found also in Bengal, the C. Prov. and S. India, extending to China, Hongkong and Java.

#### 24. ZEUXINE, Lindl.; Fl. Brit. Ind. vi, 106.

Terrestrial herbs with succulent glabrous stems. *Leaves* membranous, sometimes withering at the time of flowering. *Flowers* small, in racemes or spikes. *Sepals* subequal; lateral pair free, the dorsal one concave. *Petals* like the dorsal sepal, and with it forming a hood to the column. *Lip* adnate to base of column, cymbiform or saccate at the base; apical lobe shortly clawed or sessile, divided into two subquadrate more or less truncate diverging lobules, or entire, or with narrow decurved lobules, the basal sac with calli or laminae within. *Column* very short, its anterior face with lamellar or conical processes; stigmas 2, lateral, distinct. *Anther* membranous, sometimes ridged, the cells contiguous; pollinia pyriform, attached by an oblong gland to the erect rostellum. Species about 30, in Trop. Asia and in Trop. and S. Africa.

*Z. sulcata*, Lindl. Gen. and Sp. Orch. 485; Royle Ill. 368; F. B. I. vi, 106; Watt E. D.; K. & P. Ann. R. Bot. Gard. Calcutta, viii, 286, t. 381; Duthie id. ix, part 2, 168; Prain Beng. Pl. 1029; Cooke Fl. Bomb. ii, 708. *Pterygodium sulcatum*, Roxb. Fl. Ind. iii, 452.

Whole plant 2-10 in. high. *Stem* and peduncle glabrous. *Leaves* 1-2 in. long, linear, acuminate, sessile on the hyaline truncate sheaths, gradually passing into linear bracts higher up. *Raceme*  $\frac{1}{2}$ -2 in. long, densely fld., glabrous; fl. bract  $\frac{1}{2}$  in. long, ovate-lanceolate, acuminate, much longer than the ovary. *Flowers* about  $\frac{1}{2}$  in. long, white or pink. *Sepals* unequal, the dorsal one ovate, concave, lateral pair pink. *Petals* falcately oblong, obtuse, obliquely lanceolate, connivent. *Petals* falcately oblong, obtuse, forming with the dorsal sepal a hood over the column. *Lip* yellow, as long as the sepals, cymbiform and saccate at the base; terminal lobe short, subquadrate, entire or bifid. *Column* very short, with two wings at its apex covering the anther; rostellum with two short stout parallel arms. *Anther* depressed, very shortly beaked. *Pollinia* attached within the tip of a linear appendage of the gland. *Capsule* ellipsoid, about  $\frac{1}{2}$  in. long.

Common within the area in open turf and usually moist ground. Flowers during February and March. *DISTRIB.*: Abundant in grassy places throughout the greater portion of India, ascending to about 5,000 ft. on the outer Himalayan ranges; found also in Afghanistan, Ceylon, China, Japan, Java and the Philippines.

**25. HABENARIA, Willd. ; Fl. Brit. Ind. vi, 131.**

Terrestrial leafy herbs with undivided or lobed tubers or fleshy root-fibres. *Leaves* flat, with sheathing bases. *Flowers* small or large, in racemes or spikes. *Sepals* subequal, the lateral pair spreading reflexed or deflexed, or sometimes erect. *Petals* smaller or larger than the sepals, entire or 2-cleft, often connivent with the dorsal sepal to form a hood over the column. *Lip* adnate to base of column, entire, 3-lobed or 3 partite, its base spurred. *Column* short, usually broad; stigmas 2, distant or conjoined across the face. *Anther-cells* adnate to the front of the column, discrete, rarely touching, parallel or divergent below, their bases often prolonged into tubes containing the cundicles; staminodes rugulose, one on the outer side of each anther-cell, rarely filiform; pollinia 2, clavate or pyriform, usually grooved, sometimes 2-partite; caudicles long, short or obsolete; glands exposed, flat and discoid or elliptic and globular, or elongate with truncate ends. Species about 500, widely distributed in temp. subtrop. and trop. regions of the world.

Petals 2-partite, segments filiform; lateral sepals deflexed, tips filiform; flowers greenish . . . . . 1. *H. graveolens.*

Petals entire; lip 3-partite or lobed:—

Side-lobes of lip petaloid, truncate, much wider than the narrow linear midlobe; flowers white:—

Side-lobes of lip pectinate to the middle; petals small; spur slender, twice as long as the ovary or longer . . . . 2. *H. Susannæ.*

Side-lobes of flabelliform lip not pectinate:—

Stem leafy upwards; spur slender, twice as long as the ovary . . . . 3. *H. longijolia.*

Leaves all radical; spur equalling or longer than the ovary . . . . 4. *H. plantaginea.*

Petals entire; lip 3-partite, the side-lobes very narrow and usually filiform:—

Spur filiform, fusiform or long-clavate, as long as or longer than the ovary:—

Anther-tubes long:—

Leaves distinctly pale-margined; spur usually much longer than the ovary, funnel-shaped at the mouth and clavate at the apex . . . . . 5. *H. commelinifolia.*

Leaves not margined; spur about as long as the ovary . . . . . 6. *H. pubescens.*

Anther-tubes short:—

Leaves three or more:—

Leaves not margined; flowers green . 7. *H. turcifera.*

Leaves pale-margined; flowers yellow . . . . . 8. *H. marginata.*

Leaves two, radical, orbicular, cordate, margined; spur shorter than ovary . 9. *H. diphyllea.*

Spur small, globose ellipsoid or shortly clavate, much shorter than the ovary:—

Leaves narrowly lanceolate or elliptic; flower small, white tinged with yellow and green; tubers glabrous . . . . . 10. *H. Lawii.*

Leaves ovate or ovate-elliptic; tubers  
hairy:—

Flowers in lax subsecund spikes, white,  
fragrant . . . . . 11. *H. goodyeroides*.

Flowers in dense cylindric spikes, white  
or pale-yellow, fragrant . . . . . 12. *H. constricta*.

1. ***H. graveolens*, Duthie, (n. sp.).** *H. digitata* (not of Lindl.)  
Duthie, Ann. R. Bot. Gard. Calc. ix, part 2, 178, t. 128.

Stem 1-2 ft. high, stout, cylindric, lower portion clothed with closely fitting sheaths. Leaves  $1\frac{1}{2}$ -3 in. long, broadly lanceolate or ovate-lanceolate, acuminate, 3-5-nerved; apex acuminate and with reflexed tips; margins undulate and coarsely toothed. Raceme laxly many-flowered, about 6 in. long, elongating in fruit; floral bracts subfoliaceous, narrowly lanceolate, acuminate, longer than the slender ovary, pale-margined. Flowers subsecund, about  $\frac{3}{4}$  in. in diam. Sepals unequal, the dorsal one erect, suborbicular, its apex bluntly acuminate, green on both surfaces, minutely pustulate on the back; lateral pair longer than the dorsal one, deflexed, subfalcately lanceolate, white towards the base and tapering into short filiform tips. Petals deeply partite; segments filiform, fleshy, white, with slender recurved green tips. Lip 3-partite, lateral lobes resembling the segments of the petals, but rather longer; midlobe linear, straight, longer than lateral ones. Spur shorter than the ovary, laterally compressed, white towards the dilated mouth and with a green clavate apex. Anther-cells separate, with prominent diverging tubes. Staminodes herbaceous, oblong or orbicular, margins erose. Pollinia obliquely ovate; caudicles slender, attached by the dilated base to small brownish glands. Stigmatic processes subcylindric, blunt, recurved, the entrance to the spur lying between their bases.

Dehra Dun, at Kansrao, in sal forest (Duthie, 'Mackinnon). Flowers during July. DISTRIB.: W. Himalaya in Garhwal and Kumaon in warm valleys. The flowers have a peculiarly pungent odour resembling that of *Valeriana Wallichii*. This plant is, I now consider, quite distinct from *H. digitata* of Lindley, under which name it was described and figured in the second part of Vol. IX of the Annals of R. Bot. Gard. Calc. p. 178, t. 128. In *H. graveolens* the leaves are mostly collected at about the middle of the stem; the lateral sepals are deflexed longer and with filiform tips, and the filiform segments of the 2-partite petals are recurved at the apex.

2. ***H. Susanne*, R. Br. Prod. 312; Royle Ill. 367; F. B. I. vi, 137; Collett Fl. Siml. 501; Prain Beng. Pl. 1032; Duthie Ann.**

*R. Bot. Gard. Calc. ix, part 2, 178, t. 128.* *H. gigantea,*  
*Don. Prod. 24.* *Platanthera Susannæ, Lindl.*; *Cooke Fl. Bomb.*  
*ii, 713.* *Orchis Susannæ, Linn.*

Height of plant about 2 ft. *Tubers* elongate, 3-4 in. long. *Stem* stout with many blunt funnel-shaped sheaths on its lower portion. *Leaves* 2-6 in. long, ovate-oblong, obtuse, the upper ones bract-like, acuminate, imbricate. *Raceme* 3-5-fld.; floral bracts longer than the ovary, cucullate, acuminate. *Flowers* subsessile, 3-4 in. in diam. white tinged with greenish-yellow, fragrant. *Sepals* very broad, spreading, the dorsal one suborbicular, about 1½ in. long and broad; lateral pair 1½ in. long, obliquely oblong, obtuse. *Petals* ¼ in. long, linear-falcate, acute, fleshy. *Lip* 3-lobed, about as long as the sepals, fleshy; side-lobes very broad, truncate, deeply pectinate; midlobe linear-spathulate, with recurved margins. *Spur* slender more than twice the length of the elongate ovary. *Anther* very broad, cells divergent; tubes long, adnate to the sides of the column. *Pollinia* linear, curved, yellow, about as long as their white flexuous caudicles; glands ovoid, white. *Staminodes* linear-oblong, with crisped margins. *Stigma* on the front of the column. *Capsule* with pedicel 2 in. long, ellipsoid, beaked.

Siwalik range (Royle). Flowers July-Sep. DISTRIB.: Outer Himalayan ranges in Garhwal and Kumaon up to 6,000 ft.; Chota Nagpur and in the hilly districts of Bombay and S. India, extending to Burma, China and the Malay Archipelago.

3. *H. longifolia*, *Buch.-Ham. in Lindl. Gen. & Sp. Orch. 324;*  
*F. B. I. vi, 141;* *Prain Beng. Pl. 1032;* *Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 181.* *H. trapezoidea, Falc. mss.*

*Stem* 10-18 in. high, slender, leafy. *Leaves* 3-5 in. long, scattered erect, linear, acuminate, smaller upwards. *Spike* 2-2½ in. long, few and laxly fld.; floral bracts linear, acuminate, longer than the slender beaked ovary. *Flowers* medium-sized, white. *Sepals* minute, the lateral pair ½ in. long, oblong-lanceolate, 3-nerved, larger than the dorsal one. *Petals* gibbously ovate, as long as the dorsal sepal, 3-nerved. *Lip* flabelliform, ½-¾ in. long and broad; side-lobes semicircular, entire; midlobe linear, shorter than the side-lobes. *Spur* slender, twice as long as the ovary, green. *Anther* beaked, cells parallel; tubes incurved. *Stigmatic processes* short, clavate, incurved towards the mouth of the spur. *Rostellum* long, erect, spathulate.

Siwalik range, on the Mohand Pass ("Portus Kheree") Royle. DISTRIB.: N. Bengal at Nathpur in Purnea (Buch.-Hamilton). I have seen no living or herbarium specimens of this plant.

4. *H. plantaginea*, Lindl. Gen. & Sp. Orch. 323; Hook. f. F. B. I. vi, 141; Prain. Beng. Pl. 1032; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 181, t. 132; Cooke Fl. Bomb. ii, 718. *Orchis platyphyllos*, Roxb. Fl. Ind. iii, 609.

*Tubers* ellipsoid, about  $1\frac{1}{2}$  in. long. *Stem* scapigerous. *Leaves* about three or four, radical, horizontal, 3-6 in. long, elliptic-oblong, sub-obtuse, membranous. *Scape* slender, 8-12 in. high, bearing many lanceolate acuminate bracts, the lowest often larger and leaflike. *Spike* 2-5 in. long, laxly flowered. *Flowers* subsecund, white; floral bracts lanceolate, acuminate or setaceous, half as long as the curved beaked ovary. *Sepals* subequal, about  $\frac{1}{2}$  in. long, strongly 3-nerved, white tinged with green; dorsal erect, ovate-oblong; the lateral pair falcately oblong, spreading. *Petals* linear-lanceolate, adpressed to and forming a hood with the dorsal sepal. *Lip* 3-lobed, flabelliform, clawed, twice as long as the lateral sepals, puberulous; side-lobes semi-ovate, entire or with undulate margins, often overlapping at their tips; midlobe a little shorter, linear-oblong, deflexed. *Spur* equal to or longer than the ovary, tapering to the apex, greenish-yellow. *Anther* broad, cells divergent; tubes short, upcurved. *Pollinia* globose or ellipsoid; caudicles curved, widening upwards from a narrow base; glands falcately ovate, connate when young. *Stigmatic processes*, large, fleshy, oblong; rostellum triangular, broad. *Staminodes* prominent with sinuate margins. *Capsule*  $\frac{3}{4}$  in. long, turgid, curved.

Dehra Dun (Falconer, Duthie). Flowers Sep. and Oct. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon up to 7,000 ft.; also in Sikkim and Bengal and southwards to the Konkan and Deccan to Ceylon.

5. *H. commelinifolia*, Wall. in Lindl. Gen. & Sp. Orch 325; Hook. f. F. B. I. vi, 143; Prain Beng. Pl. 1032; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 183, t. 134; Cooke Fl. Bomb. ii, 719. *Orchis commelinifolia*, Roxb. Fl. Ind. iii, 451.

*Stem* 2-3 ft. high, loosely sheathed at the base. *Tubers* ellipsoid or cylindric. *Leaves* scattered, 3-6 in. long, oblong or oblong-lanceolate, subcordate, acute and often subspinescent at the tips, margins pale. *Spike* 4-8 in. long, many-and loosely flowered; flowering bracts erect, nearly equaling the long-beaked ovary, scaberulous on both surfaces and ciliolate on the margins. *Flowers*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., white, inodorous. *Sepals* scaberulous; dorsal small, saccate, with a short curved beak; lateral pair spreading, much shorter, hatchet-shaped, beaked,

the veins deeply looped or arched. *Petals* unequally oblong, smaller than the lateral sepals. *Lip* divided into three long filiform segments, about 1 in. long from its base to the tip of the mid-segment; lateral ones  $1\frac{1}{2}$  in. long, curved downwards; mid-segment channelled above, spreading, scaberulous; spur  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, slender and curved downwards, its upper portion funnel-shaped and white, its apex clavate and green. *Anther-cells* elongate, distant, diverging at the base; tubes long, straight. *Pollinia* small, oval; caudicles very long, dilated upwards, translucent; glands minute. *Staminodes* seated on the long arms of the column and curving round in front of the anther tubes. *Stigmatic processes* large, clavate, incurved; *rostellum* triangular.

Dehra Dun and Siwalik range, usually in open grassy places (Mackinnon, Duthie). Flowers during Aug. and Sep. *DISTRIB.*: Outer ranges of W. Himalaya from the Punjab to Kumaon, up to 5,000 ft., extending eastwards to Parasnáth, Chota Nagpur and Upper Burma, and south to Cent. W. and S. India.

**6. *H. pubescens*, Lindl. Gen. & Sp. Orch. 322; Hook. f. F. B. I. vi, 144; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 183, t. 135.**

*Tubers* elongate, stout, often divided, and with a few thick fleshy fibres from their summits. *Stem* 12-18 in. high, clothed at the base with a few tight-fitting pubescent sheaths. *Leaves* crowded towards the middle or base of the stem, 4-6 in. long, lanceolate, acuminate, tapering to the base, 7-9 nerved, undulate, not margined. *Raceme* with a few empty leaflike bracts at its base, 8-10 in. long, lax, many-fl., pubescent; floral bracts longer than the long-beaked ovary, ovate lanceolate, acuminate, ciliolate. *Flowers* small, greenish-yellow. *Dorsal sepal*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, broadly ovate, a little shorter than the dimidiate-ovate obtuse deflexed lateral ones. *Petals* narrowly falcate, longer than the dorsal sepal and forming with it a hood over the column. *Lip* 3-partite, longer than the sepals; segments linear with filiform tips; midlobe shorter, obtuse, keeled beneath. *Spur* slender, about as long as the curved ovary. *Anther-tubes* long, flexuous. *Pollinia* ovate, obliquely attached to the long slender flexuous caudicles; glands flat; staminodes prominent. *Stigmatic processes* globose. *Capsule* curved and with a long beak, prominently ridged.

Dehra Dun (Mackinnon). *DISTRIB.*: Outer ranges of W. Himalaya in Garhwal and Kumaon, up to 5,500 ft. (Royle, Falconer, Duthie).

**7. *H. furcifera*, Lindl. Gen. & Sp. Orch. 319; Hook. f. F. B. I., vi, 149; K. and P. Ann. R. Bot. Gard. Calc. viii, 313, t. 410; Duthie id. ix part 2, 184.**

Stem stout, 10-18 in. high, sheathed at the base, leafy below the middle bracteate above. Leaves 3-4½ in. long, elliptic, acute or acuminate. Racemes 5-7 in. long, laxly many-fld. Flowers about  $\frac{1}{2}$  in. across from base to apex, green; floral bracts about as long as the ovary, lanceolate, acuminate. Sepals unequal; dorsal one ovate-oblong, obtuse, concave; lateral pair shorter, broadly and falcately lanceolate, acute or acuminate, spreading. Petals as long as the dorsal sepal and with it forming a hood over the column, oblong, retuse. Lip 3-partite, longer than the sepals; lateral segments filiform, diverging, curved, longer than the stouter blunt midlobe. Spur slender, longer than the ovary, laterally compressed, curved at the apex. Anther-cells contiguous, diverging at their bases, the tubes rather short, up-curved. Pollinia falcately ovoid; caudicles slender, slightly curved; glands narrowly oblong. Staminodes large, broadly oblong. Stigmatic processes short. Capsule fusiform, decurved, shortly beaked, prominently ribbed.

Dehra Dun and Siwalik range (Mackinnon, Duthie). Flowers during Aug. and Sep. DISTRIB. : Outer ranges of W. Himalaya in Garhwal, up to 6,000 ft., and eastwards to Sikkim and Bhutan; also in Bengal, Assam, Orissa, and extending to Upper Burma.

**S. H. marginata**, Colebr. in Hook. *Flor. Exot.* t. 136; Hook. f. *F. B. I.* vi, 150; Collett *Fl. Siml.* 504; Prain *Beng. Pl.* 1033; Duthie *Ann. R. Bot. Gard. Calc.* ix, part 2, 184, t. 136; Cooke *Fl. Bomb.* ii, 721.

Subscapigerous, glabrous. Tubers small, narrowly cylindric. Leaves few, subradical, sessile,  $\frac{1}{2}$ -5 in. long, oblong or linear-oblong, obtuse, 3-5-nerved; margins pale-yellow. Scape 4-10 in. long; sheaths erect, lanceolate, acuminate. Spike 2-6 in. long, many-fld.; floral bracts nearly as long as the ovary, lanceolate, acuminate, with pale ciliolate margins. Flowers  $\frac{1}{2}$  in. across. Sepals green; dorsal one  $\frac{1}{2}$  in. long, erect, broadly ovate; lateral longer, falcately oblong-lanceolate, spreading or deflexed, 3-5-nerved. Petals  $\frac{1}{2}$  in. long, falcately oblong, closely adpressed to the dorsal sepal. Lip nearly  $\frac{1}{2}$  in. long, 3-partite nearly to the base, lateral segments narrowed into filiform tips; midlobe shorter and broader, the margins inflexed. Spur about as long as the curved ovary, laterally compressed at the fusiform apex. Anther-cells distant; tubes funnel-shaped, short, spreading. Pollinia obovate, with short geniculate caudicles; glands triangular. Staminodes elongate. Stigmatic processes long, adnate to the base of the column. Capsule about  $\frac{1}{2}$  in. long, fusiform, turgid.

Dehra Dun and Siwalik range (Duthie). Flowers during August  
 DISTRIB. : Western Himalaya from Kashmir to Kumaon, up to 7,000  
 ft. ; also in Bengal, and found as a weed in the Bot. Gard. Cal-  
 cutta, extending to Burma and to W. and S. India.

**9. *H. diphylla*,** *Dalz. in Hook. Journ. Bot. ii (1850), 262;*  
*F. B. I. vi, 151; Prain Beng. Pl. 1033; Duthie Ann. R. Bot. Gard.*  
*Calc. ix, part 2, 185, t. 137; Cooke Fl. Bomb. ii, 722.*

*Tubers* small, elongate or globose. *Leaves* radical, usually two, 1-2 in. in diam. ; orbicular cordate, margined, rather fleshy. *Scape* 4-10 in. high, with a few distant lanceolate acuminate bracts. *Flowers* many, distant, spreading, about  $\frac{1}{2}$  in. diam. white tinged with green ; floral bract much shorter than the slender curved ovary. *Sepals* about  $\frac{1}{2}$  in. long ; dorsal erect, ovate, concave, acute, obscurely nerved ; lateral pair slightly longer, deflexed, obliquely ovate, acuminate, 3-nerved. *Petals* linear, white, as long as the dorsal sepal and forming a hood with it. *Lip* much longer than the sepals, 3-partite ; segments filiform, white with green tips, lateral pair spreading and with spirally twisted tips ; midlobe shorter, deflexed. *Spur* shorter than the ovary, inflated towards the acute inflated apex. *Anther* broad, the cells distant ; tubes very short. *Pollinia* dimidiate-ovate, obliquely attached to caudicles equaling them in length ; glands very small, flat, circular. *Staminodes* large, petaloid. *Stigmatic processes* elongate, clavate, adnate to the mouth of the spur. *Rostellum* obscure.

Dehra Dun (Mackinnon). Flowers during Aug. DISTRIB. : Outer ranges of W. Himalaya in Garhwal (Falconer) ; eastwards to Bengal and Chota Nagpur, and southwards from Konkan and Kanara to Malabar.

**10. *H. Lawii*,** *Hk. f. in F. B. I. vi, 162; Prain Beng. Pl. 1033;*  
*Duthie Ann. R. Bot. Gard. Calc. ix, Part 2, 192, t. 143. Peristylus*  
*Lawii Wight Ic. t. 1695; Cooke Fl. Bomb. ii, 712.*

*Tubers* ellipsoid or globose. *Stem* 6-12 in. high, slender, with a few short loose sheaths below the leaves. *Leaves* 3-5, clustered above the middle of the stem, 3-4 in. long, narrowly lanceolate or elliptic, acute, membranous. *Spike* 2-3 in. long, slender, narrow, many-fld. *Flowers* small, crowded, spreading, white tinged with yellow and green ; floral bracts ovate-lanceolate, acuminate, longer than the slender curved ovary. *Sepals* and petals  $\frac{1}{2}$  in. long, white tinged with yellow at the base, connivent, obtuse ; dorsal sepal elliptic, concave ; lateral subfalcately linear-oblong. *Petals* oblong, obtuse, fleshy. *Lip* as

long as the sepals, broadly and obtusely 3-fid.; lobes rounded at the apex; midlobe twice as long as the lateral pair, its claw green tinged with yellow, and with a short ciliate ridge at its base. *Spur* small, globular, dark-green. *Anther-cells* parallel, tubes none. *Pollinia* obovate; caudicles nearly as long, attached to minute globular glands. *Staminodes* large, green, with broad white margins. *Stigmatic processes* short, clavate. *Rostellum* short, triangular, acute.

Dehra Dun (Mackinnon, Duthie). Flowers during July and August.

DISTRIB.: W. Himalaya, in Garhwal (Herb. Calc.); Bengal and Bihar; C. Prov., in the Chanda district, and extending to S. India from the Konkan.

**11. *H. goodyeroides*, Don** Prod. Fl. Nep. 25; F. B. I. vi, 161 (in part); K. & P. Ann. R. Bot. Gard. Calc. viii, 326, t. 430; Duthie id. ix, part 2, 192; Collett Fl. Siml. 505; Prain Beng. Pl. 1039 *Peristylus goodyeroides*, Lindl. Gen. & Sp. Orch. 299.

*Tubers* ellipsoid or ovoid, hairy. *Stem* stout, 1-2 ft. high, its lower portion clothed with many loose blunt sheaths. *Leaves* clustered above the middle of the stem, but not in whorls, 6-10 in. long, ovate or ovate-elliptic, acute, narrowed to the shortly sheathed base. *Spike* 4-8 in. densely flowered, its peduncle bearing a few lanceolate acuminate bracts. *Flowers* subsecund, white, fragrant, about  $\frac{1}{2}$  in. across; floral bracts narrowly lanceolate, acuminate, about as long as the slender curved ovary. *Sepals* unequal, tinged with brown, the dorsal one broadly ovate-lanceolate, concave, conniving with the petals and forming a hood; lateral pair oblong, involute, apiculate. *Petals* as long as sepals, trapeziform, blunt. *Lip* longer than the petals, 3-lobed; side lobes linear-oblong falcate, acute, slightly longer than the broad blunt midlobe, *Spur* minute, subglobose, much shorter than the sepals. *Column* short, broad. *Anther-cells* parallel, not contiguous, tube none. *Pollinia* pyriform, caudicles very short, the glands small, obovoid. *Staminodes* large, oblong, spreading. *Stigmatic processes* short, lying beneath and parallel to the staminodes.

Dehra Dun (Mackinnon). Flowers during July and August. DISTRIB.: Outer Himalayan ranges from Garhwal to Sikkim and Bhutan; also in Assam, Khasia Hills and south to Bengal, extending to China.

**12. *H. constricta*, Hook. f. in F. B. I. vi, 161; K. & P. Ann. R. Bot. Gard. Calc. viii, 325, t. 429; Duthie id. ix, part 2, 193; Prain Beng. Pl. 1033. *H. goodyeroides*, Lindl. in Wall. Cat. 7066**

(not of Don). *Platanthera constricta*, Lindl. in Wall. Cat. 7043. *Herminium constrictum*, Lindl. in Bot. Reg. under t. 1449. *Peristylus constrictus*, Lindl. Gen. and Sp. Orch. 300.

*Tubers* oblong, hairy. *Stem* stout, 2-3 ft. high, clothed at the base with wide blunt sheaths. *Leaves* five or six, on upper portion of stem, more or less whorled, 4-7 in. long, ovate-elliptic, acute or acuminate, narrowed towards the long sheaths; bracts on the peduncle linear-lanceolate, acuminate. *Spike* broadly cylindric, 4-8 in. long, many-and densely-flowered. *Flowers* spreading, white or pale yellow, sweet-scented; floral bracts large, erect, lanceolate, acuminate, about as long as the ovary. *Sepals* subequal,  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, oblong, obtuse, ciliolate; lateral pair spreading, with involute edges. *Petals* larger than the sepals, obliquely ovate-lanceolate, somewhat gibbous on the lower side, spreading upwards in front of the dorsal sepals, but not connivent to form a hood. *Lip* as long as the petals, 3-lobed to about the middle; lateral lobes linear, acuminate, somewhat diverging at their tips; midlobe shorter, oblong, tapering to a blunt point. *Column* very short and broad. *Anther-cells* close together but not contiguous; tubes none. *Pollinia* obovoid, caudicles short, tapering to the large oblong-elliptic glands. *Staminodes* oblong, obtuse. *Stigmatic processes* clavate, spreading. *Rostellum* erect, 2-fid.

Siwalik range (Duthie); Dehra Dun, in sál forests (Mackinnon). Flowers during July and August. DISTRIB. : Outer Himalayan valleys in Kumaon and in Sub-tropical Sikkim; also in Assam, Chota Nagpur and Chittagong, extending to Upper and Lower Burma.

### CVIII. SCITAMINEÆ.

Herbs, often large, frequently with a pseudostem of convolute leaf-sheaths, rarely with a woody caudex. *Leaves* radical or caudine, usually membranous; sheaths generally large, clasping the stem; lamina with a strong midrib; secondary nerves close pinnate, parallel. *Flowers* 2-sexual, rarely 1-sexual (as in *Musa*), irregular, solitary or spicate; bracts membranous or herbaceous, bracteoles membranous or none. *Perianth* 2-seriate, superior; outer segments 3, calycine, rarely petaloid, free and imbricate or connate in an entire toothed or spathaceous tube; inner segments petaloid, connate in a long or short corolla-tube, free or adnate to the petaloid staminodes; limb 3-partite, the segments

free or connate. *Stamens* only 1 perfect, the rest replaced by petaloid staminodes, or 5 perfect and a sixth imperfect or obsolete; anthers linear, 2-celled, rarely of one cell on the margin of a petaloid connective. *Ovary* inferior, 3-rarely 2-or 1-celled; style usually slender, with 2 short stylodes crowning the ovary, stigma entire or subentire; ovules usually many, axile, rarely parietal, anatropous. *Fruit* a loculicidally 3-valved capsule or indehiscent and membranous or fleshy, usually crowned by the remains of the perianth. *Seeds* often arillate, albumen floury, embryo small.—Species 400-500, chiefly tropical.

Stamen only one perfect, others reduced to staminodes or wanting:—

Anther 2-celled; calyx tubular or spathaceous; style slender, embraced below the stigma by the anther:—

Ovary 1-celled; placentas 3, parietal; cor-tube long; flowers yellow . . . . 1. GLOBBA.

Ovary 3-celled; placentas axile:—  
Lateral staminodes broad:—

Connective not spurred at the base; cor-tube long, slender:—

Filament short; connective broad, crested; stigma turbinata . . . . \* KÆMPFERIA.

Filament long, narrow; connective very narrow, not crested; stigma subglobose . . . . . 2. HEDYCHIUM.

Connective spurred at the base; cor-tube funnel-shaped; stigma 2-lipped, the lips ciliate; bracts forming a cone-like spike . . . .

3. CURCUMA.

Lateral staminodes small or none, rarely narrow and adnate to the lip; cor-tube cylindric:—

Flowers in a dense cone-like spike:—

Filament short; anther-cells contiguous, parallel; connective produced as a narrow appendage as long as the anther; stigma small, subglobose; spikes usually

produced direct from the root-stock, sometimes at the top of a leafy stem . . . . .

4. ZINGIBER.

Filament forming with the produced connective an oblong petaloid process, with the contiguous linear anther-cells placed in its middle; stigma with a semilunar pit ciliate round the margin; spikes usually at the top of leafy stems . . . . .

5. COSTUS.

Flowers in racemes or panicles at the top of leafy stems; filament long; anther-cells divergent at apex; stigma subglobose . . . . .

\* ALPINIA.

Anther 1-celled, laterally adnate to a petaloid filament; calyx of free sepals:—

Staminal tube with 5 subsimilar slightly unequal petaloid segments, the 1-celled anther adnate to one of the smaller segments; ovary 3-celled; placentas many-ovuled . . . . .

\* CUNNA.

Stamens 5 perfect, free, the 6th imperfect or absent; sepals united in a split spathe-like tube; corolla short, included and enveloping the stamens and style; fruit fleshy, indehiscent; leaves very large . . . . .

\* MUSA.

The genera marked with an asterisk in the above key are not truly indigenous within the area of this flora.

1. GLOBBA, Linn.; Fl. Brit. Ind. vi, 201.

Herbs with creeping rhizomes and erect stems. *Leaves* oblong or oblong-lanceolate. *Flowers* in terminal panicles, rarely in spikes, bracts usually deciduous, buds often replaced by bulbils. *Calyx* funnel-shaped, 3-lobed. *Corolla* 3-lobed, longer than calyx; lobes ovate, subequal. *Stamen* 1, filament long, incurved, with 2 dorsal appendages; anther oblong; connective simple, winged or spurred, produced beyond the cells. *Ovary* 1-celled; style filiform, placed in a groove of the filament, stigma turbinate; ovules many, on 3 parietal placentas. *Fruit* a globose capsule,

tardily dehiscent. *Seeds* many, small, ovoid, with a small white lacerate aril.—Species 60 to 70, in India, Malaya, China, Philippines and New Guinea.

**G. orixensis.** Roxb. in *Asiat. Res.* xi, 358; *Fl. Ind.* i, 78; *F. B. I.* vi. 201; *Prain Beng. Pl.* 1037.

Herb with perennial rootstock and annual leafy stems, 1-2 ft. high. *Leaves* 8-10 in. long, glabrous beneath. *Panicle* long, narrow; lower branches 2-3-fid. at tip; bulbils none; bracts small, deciduous. *Flowers* deep-orange. *Corolla* segments staminodes and lip equal in length. *Lip* spotted with reddish brown at the throat. *Capsule* warted.

Dehra Dun and on the Siwalik range. Flowers during the rains.—  
DISTRIB.: Bengal, Chota Nagpur, Bihar, Sikkim, N. Circars (Roxburgh).

**2. HEDYCHIUM,** Koenig; *Fl. Brit. Ind.* vi, 225.

Herbs with perennial horizontal tuberous rootstocks; root-fibres not much thickened; stem elongate, leafy. *Leaves* distichous, oblong or lanceolate. *Flowers* usually in terminal spikes; bracts oblong, subcoriaceous, 1- or more-flowered. *Calyx* tubular, 3-toothed. *Corolla-tube*, long, slender; lobes equal, linear, spreading. Perfect stamen 1; filament long, slender, anther-cells contiguous, connective not produced; lateral staminodes linear or cuneate-oblong; lip large, bifid. *Ovary* 3-celled; style long, filiform, stigma subglobose; ovules many, superposed on axile placentas. *Fruit* a globose 3-valved capsule. *Seeds* many, small, with a lacerate aril.—Species 38, chiefly Indian and Malaya.

**H. coronarium,** Koen. in *Retz. Obs. Bot. fasc.* iii, 173; Roxb. *Fl. Ind.* i, 10; *F. B. I.* VI, 225; *Prain Beng. Pl.* 1039; *Cooke Fl. Bomb.* ii, 728.

A tall herb with erect leafy stems, 4-6 ft. high; rootstock  $\frac{1}{2}$ -2 in. in diam., fleshy, jointed. *Leaves* sessile, 9-14 in. long, lanceolate, finely acuminate, glabrous above, glabrous or sparsely pubescent beneath; base narrowed; sheath smooth; ligule membranous. *Flowers* pure white, fragrant, in dense oblong spikes 4-8 in. long; bracts closely imbricate, 3-4-fid.; the outer ones  $1\frac{1}{2}$ -2 in. long, ovate, obtuse; bracteoles 3, membranous. *Calyx*  $1\frac{1}{4}$  in. long, cylindric, green, shorter than the bracts. *Corolla-tube* 3 in. long; segments half as long as the tube, reflexed. *Lateral staminodes*  $1\frac{1}{2}$ -2 in. long.

subobtuse, white. *Lip*  $1\frac{1}{2}$ -2 in. broad, suddenly contracted into a short claw; lobes short, rounded. *Stamen*  $1\frac{1}{2}$  in. long; anther about  $\frac{1}{2}$  in. *Capsule* oblong, glabrous, the valves orange-yellow within. *Seeds* with a crimson aril.

Dehra Dun (Duthie). Flowers during the rains. *DISTRIB.* : Throughout India from the Himalaya and the Khasia Hills southwards to Chittagong, Bengal, Kanara, Konkan and Ceylon, extending to Malay Pen. and Islands. See Kew Bulletin (No. 9, 1912) for an account of the fibre yielded by this and allied species of *Hedychium*, and of its value as a material for paper-making. See also Watt's "Comm. Products of India" p. 776.

**3. CURCUMA,** Linn.; *Fl. Brit. Ind.* vi, 209.

Stemless herbs with tuberous rootstocks bearing sessile and long-stipitate tubers. *Leaves* usually oblong, often very large. *Flowers* usually in dense compound spikes, vernal or æstival and preceding the leaves or autumnal and coetaneous, crowned by a coma of enlarged coloured bracts; lower bracts ovate, membranous, enclosing several bracteolate fugitive flowers which open in succession. *Calyx* short, cylindric, minutely toothed. *Corolla*-tube funnel-shaped; segments usually ovate or oblong; upper longer, somewhat concave. *Stamen* 1, perfect, filament short, anther not crested; cells contiguous, spurred at the base; lateral staminodes oblong, petaloid, connate with the filament; lip orbicular, with a deflexed tip. *Ovary* 3-celled, style filiform; stigma 2-lipped, the lips ciliate; ovules many, on axile placentas. *Fruit* a tardily dehiscent globose membranous 3-valved capsule. *Seeds* ovoid or oblong, usually arillate.—Species about 40, mostly in S. E. Asia.

**C. angustifolia,** Roxb. in *As. Res.* xi, 338, t. 3; *Fl. Ind.* i, 31. *Royle Ill.* 357, 359; *F. B. I.* vi, 210; *Watt E. D.*; *Collett Fl. Siml.* 512; *Prain Beng. Pl.* 1041. Vern. *Tikhur*.—E. Indian Arrow-root.

*Rootstock* small, emitting long fleshy fibres terminating in pale oblong pendulous tubers. *Leaves* (with petiole)  $1-1\frac{1}{2}$  ft.; blade lanceolate, acute  $\frac{1}{2}$ -1 ft. long. *Fl. spike* lateral, apart from and usually appearing earlier than the leafy spike, crowned by several enlarged empty pink bracts. *Flowers* yellow, longer than their bracts, 3 or 4 together in the axil of each bract opening in succession and quickly

fading; sheaths of pseudostem pale-green. *Calyx* 3-toothed. *Corolla-tube*  $\frac{1}{2}$  in. long, somewhat gibbous; upper lobe erect, concave, ovate, longer than the two lateral ones. *Lateral staminodes* oblong, united to the filament; the lower large, broad, spreading, notched; connective produced at the base in a fork. *Capsule* ovoid, ultimately opening by 3 valves. *Seeds* many, small.

Abundant in Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowering during the rains. *DISTRIB.*: Outer ranges of Central Himalaya, also in W. Behar and N. Bengal; extending to Bombay and S. India. A kind of starch resembling arrowroot is prepared from the tubers.

**C. LONGA**, *L. Sp. Pl. 2; Roxb. Fl. Ind. i, 32; Royle Ill. 358; F. B. I. vi, 214; Duthie in Field and Gard. Crops iii, 41, t. 77; Watt E.D.; Comm. Prod. Ind. 445; Prain Beng. Pl. 1042; Kanjilal For. Fl. (ed. 2) 405; Cooke Fl. Bomb. ii, 732. Vern. Haldi—Turmeric.—A tall herb. *Rootstock* large, ovoid, with sessile cylindric tubers orange-coloured inside. *Leaves* very large, in tufts up to 4 ft. or more long, including the petiole which is about as long as the blade, oblong-lanceolate, tapering to the base. *Flowers* in autumnal spikes, 4-6 in. long; peduncle 6 in. or more, concealed by the sheathing petiole; flowering bracts pale-green; bracts of coma tinged with pink.—This plant is much cultivated throughout India chiefly for the yellow dye obtained from the tubers, which also used as a condiment. The plant was probably introduced originally from China, though having all the appearance of being wild in Behar and Ch. Nagpur.*

**4. ZINGIBER**, Adans.; Fl. Brit. Ind. vi, 243.

Herbs with elongated leafy stems and horizontal tuberous rootstocks. *Leaves* oblong-lanceolate. *Flowers* in spikes, usually radical, less often terminal, rarely lateral on the leafy stems; peduncle short or long; bracts persistent, usually 1-fld. *Sepals* 3, connate in a cylindric shortly 3-lobed calyx. *Petals* 3, connate in a corolla with cylindric tube; lobes lanceolate, the upper concave. *Stamen* 1 perfect; filament short; anther 2-celled; cells contiguous, with a narrow crest as long as themselves; lateral staminodes none, or adnate to the obovate-cuneate lip. *Carpels* 3, connate in a 3-celled ovary; ovules many, superposed; placentas axile; style filiform; stigma small, subglobose. *Fruit* an oblong capsule, tardily dehiscent. *Seeds* large, globose, arillate.—Species about 30 or more, in tropical regions of the Old World.

*Z. capitatum*, Roxb. in *Asiat. Res. xi*, 348; *Fl. Ind. i*, 55; *F. B. I. vi*, 248; *Prain Beng. Pl. 1045*.—Vern. *Jangli-adrak*.

*Rootstock* of many long-stalked oval tubers with a spicy fragrance. *Stems* slender, leafy, 3-4 ft. high. *Leaves* 12-18 in. long, linear, acuminate, ascending, usually pubescent beneath. *Spike* terminal, sessile, or somewhat prolonged beyond the sheaths of the upper leaves, erect or oblong-cylindric, 3-6 in. long; *bracts* closely imbricate, 1½ in. long, ovate, green with a narrow brown edge. *Cor-tube* as long as the bract, segments pale-yellow. *Lip* pale-yellow, not spotted; midlobe ¼ in. broad, orbicular, emarginate; basal auricles large, oblong, obtuse. *Capsule* bright-red, size of small olive, valves ovate. *Seeds* black, shining; *aril* large, lacerate, white.

Dehra Dun (Duthie), Banda (Edgew.), Gorakhpur (Burkhill). Flowers in rains. *DISTRIB.* : Central Himal. from Kumaon to Sikkim; also Khasia Hills, Sylhet, Ch. Nagpur, and Chânda in Cent. Prov.

*Z. OFFICINALE*, Roxb.; *Fl. Ind. i*, 47; *F. B. I. vi*, 246; *Watt E. D.*; *Comm. Prod. Ind. 1139*; *Duthie in Field and Gard. Crops, part iii*, 47, t. 100; *Kanjilal For. Fl. (ed. 2)* 405; *Prain Beng. Pl. 1045*; *Cooke Fl. Bomb. ii*, 736.—Vern. *Adrak* (fresh root), *sunt* (when dry)—*Ginger*.—A herb, with horizontal jointed tuberous rhizomes. *Stems* slender, 3-4 ft. high. *Leaves* 6-12 in. long, lanceolate, glabrous beneath. *Bracts* suborbicular, cuspidate. *Cor-lobes* green; *Lip* and stamen purplish-black.—The ginger plant is much cultivated in Dehra Dun and throughout the Sub-Himalayan tracts of Rohilkhand and N. Oudh, and elsewhere in India. It has also been extensively introduced in the tropics of both hemispheres. The plant is known to have been grown in India and China for many centuries, but there is no record of its having been found in a truly wild condition. The usual vegetative mode of cultivating the ginger plant has brought about a tendency to cause sterility as in *Musa* and *Citrus*.

##### 5. COSTUS, Linn.; *Fl. Brit. Ind. vi*, 249.

Herbs with long leafy stems; rootstock tuberous, horizontal. *Leaves* oblong, with broad sheaths. *Flowers* in dense globose or ovoid usually terminal spikes. *Calyx* short, funnel-shaped; teeth 3, ovate. *Corolla-tube* not longer than the calyx; segments large, oblong, subequal. *Lip* large, obovate with incurved margins. *Stamen* 1 perfect, filament forming with the connective an oblong petaloid process with the contiguous linear anther-cells situated in its middle; lateral staminodes minute or obsolete. *Ovary* 3-celled,

style filiform, stigma with a semilunar marginally ciliate foveola; ovules many, superposed. *Fruit* a globose or ovoid capsule, finally dehiscing on one side between the ribs. *Seeds* obovoid or subglobose, aril short.—Species nearly 100, in the tropics of both hemispheres. Many of them are cultivated for their handsome flowers.

**C. speciosus**, Smith in *Trans. Linn. Soc. i*, 249; Roxb. *Fl. Ind. i*, 18; F. B. I. vi, 250; Watt E. D.; Prain *Beng. Pl. 1045*; Cooke *Fl. Bomb. ii*, 736; Kanjilal *For. Fl. (ed. 2)* 406.—Vern. *Kust*.

An erect herbaceous plant, 4-6 ft. high. *Stem* somewhat woody at the base. *Leaves* subsessile, arranged spirally, 6-12 in. long, oblong or oblanceolate, acute or acuminate, often cuspidate, glabrous above, silky-pubescent beneath, base rounded; sheaths coriaceous: ligule none. *Flowers* many, in dense terminal spikes 2-5 in. long; bracts bright red,  $\frac{3}{4}$ -1 $\frac{1}{4}$  in. ovate, acuminate or pungently mucronate; bracteole solitary,  $\frac{1}{2}$  in. long. *Calyx* 1 $\frac{1}{2}$  in. long, deltoid-ovate, cuspidate. *Corolla-tube* as long as calyx; lobes ovate-oblong, apiculate, lateral lobes about 1 $\frac{1}{2}$  in. long, dorsal one rather shorter; lip suborbicular, white with a yellow centre, 2 in. or more in diam.; concave, plicate, crisped; disk pubescent and with a tuft of hairs at the base. *Stamen* 1 $\frac{1}{2}$ -1 $\frac{1}{4}$  in. long, with a tuft of hairs at the base of the filament; connective petaloid,  $\frac{1}{2}$  in. broad, pubescent, produced into two glabrous appendages about as long as the linear anther-cells. *Style* slender, 1 $\frac{1}{2}$  in. long; stigma with a semilunar ciliate mouth. *Capsule*  $\frac{3}{4}$  in. in diam., globose trigonous, red. *Seeds* black, with a white aril.

*Dehra Dun* and *Siwalik* range, common in sál forest, and eastwards along the Sub-Himalayan tracts of *Rohilkhand* and *N. Oudh*, usually in moist shady places. Flowers during the rainy season. *DISTRIB.*: Outer ranges of *Himalaya*, up to 4,000 ft.; and more or less throughout India; also in *Ceylon*, *Malay Pen.* and *Islands* and in *China*.

The following non-indigenous plants belonging to this family are occasionally cultivated within the area of this flora:—

**KEMPFERIA GALANGA**, Linn. *Sp. Pl. 3*, Roxb.; *Fl. Ind. 15*; *F. B. I. vi*, 219; Watt E. D.; Prain *Beng. Pl. 1038*; Cooke *Fl. Bomb. ii*, 726.—Vern. *Chandra-mula*. A stemless herb. *Leaves* appearing with the flowers, sessile, suborbicular, 3-6 in. long, spreading flat on the ground. *Corolla-segments* lanceolate; lip white with lilac throat. *Lateral staminodes* cuneate-obovate. More or less through-

out India, wild or cultivated, extending to the Malay Pen. and Islands, also in China. It is often grown in gardens within the area of this flora. The tubers are employed in perfumery and in Hindu medicine.

**K. ROTUNDA**, *Linn. Sp. Pl. 3; Roxb. Fl. Ind. i, 16; F. B. I. vi, 222; Watt E. D.; Prain Beng. Pl. 1038; Cooke Fl. Bomb. ii, 727.*—*Vern. Bhui-Champa.*—A stemless herb. Leaves petioled, erect, oblong, 12 by 3 in., appearing after the flowers. *Corolla-segments* long, linear. *Lip* lilac or reddish. *Staminodes* oblong, acute.—Wild or cultivated throughout India, extending to Malay Pen. and Islands. Flowers very fragrant.

**ALPINIA NUTANS**, *Roscoe; Roxb.; Fl. Ind. i, 65; F. B. I. vi, 256; Watt E. D.; Gamble Man. 723; Cooke Fl. Bomb. ii, 738.*—Stems up to 10 ft. high. Leaves 1-2 ft. long by 3-6 in., oblong-lanceolate. Flowers very handsome, in panicles 6-12 in. long, the rhachis very hairy; bracts large, concave, ivory-white tinged with pink and variegated with red and yellow.—Mr. Gamble states that this planted in Dehra Dun at Rajawala, where it affords good fodder for elephants. It is also much grown as an ornamental plant in gardens. It is a native of the E. Himalaya and Burma, extending to the Malay Pen. and Islands.

**CANNA INDICA**, *Linn.; var. ORIENTALIS Rosc; F. B. I. vi, 260. Prain Beng. Pl. 1047. C. indica, Linn.; Roxb.; Fl. Ind. i, 1.; Watt E. D.; Cooke Fl. Bomb. ii, 744.*—Rootstock tuberous, with many fibres. Stems 3-4 ft. high. Leaves 6-18 in. long, oblong or elliptic-lanceolate, caudate-acuminate. Flowers distant,  $2\frac{1}{2}$  in. long, scarlet or yellow. The seeds are black and shining and are known under the name of *Indian shot*. This species is much grown in Indian gardens for its handsome flowers.

**MUSA**, *Linn.*—Tree-like herbs with stout stems composed of convolute leaf-sheaths. Leaves very large, oblong, spirally arranged. Flowers in an erect or decurved subterminal spike, practically 1-sexual, the lower female, the upper male; bracts large, spathaceous, ovate or orbicular. *Calyx* tubular, spathaceous, 3-5-lobed, slit to the base on one side. *Petals* connate, forming a unilateral corolla as long as the calyx or shorter, convolute round the stamens and style. *Stamens* 5, perfect, the 6th rudimentary or obsolete; filaments stout, filiform; anthers linear, erect, 2-celled. *Carpels* 3, connate in a 3-celled ovary; ovules many; style filiform from a thickened base; stigma 6-lobed, subglobose. *Fruit* oblong or fusiform, 3-gonous, fleshy, indehiscent. *Seeds* subglobose or angled by pressure, in cultivated forms often obsolete.—Species about 40, in tropical

regions mostly of the Old World. As a cultivated plant *Musa* has spread extensively throughout the warmer regions of both hemispheres, and more especially the kinds which yield the well-known and highly valued *banána* and *plaintain* fruit (*M. paradisiaca* and its subspecies *sapientum*).

**M. PARADISIACA**, *L. Sp. Pl.* (1753) 1043; *K. Schum* in *Engl. Pflanzenreich* *iv*, pt. 45 (1900), 19; *Cooke Fl. Bomb.* *ii*, 742; *Rendle Fl. Pl.*, part *I*, 331. *M. paradisiaca*, var. *normalis*, *O. Kunze* *Revis. Gen.* *ii*, (1891) 692. *M. sapientum* var. *paradisiaca*, *Baker* in *F. B. I. vi* (1893) 262; *Watt E. D.* and in *Comm. Prod. Ind.* 786; *Prain Beng. Pl.* 1050; *Kanjilál For. Fl.* (ed. 2), 405; *Gamble Man.* 723.—Vern. *Kach-kela*. The Plantain.—*Male fls.* and *bracts* subpersistent. *Fruit* cylindric, up to 12 in. long, usually yellowish-green when ripe, pulp hardly sweet and rather firm, only edible when cooked.—A variety of the above (var. *sylvestris* of *Prain*) is found apparently wild in Dehra Dun in the Khairi swamp and in shady ravines of Nágásidh Hill, also at Sahánsra-dhára. It is frequently met with at low elevations on the outer ranges of the Himalaya, and has been recorded also from Chota Nagpur and Chittagong. The fruit of this plant contains many seeds and is not edible.

**M. PARADISIACA**, subsp. **SAPIENTUM**, *K. Schum* in *Engl. Pflanzenreich* *iv*, pt. 45 (1900) 20; *Cooke Fl. Bomb.* *ii*, 742; *Rendle Fl. Pl.* part *I*, 331. *M. paradisiaca*, var. *sapientum*, *O. Kunze* *Revis. Gen.* *ii*, 692. *M. sapientum* (*sp.*), *L.*; *Baker* in *F. B. I. vi*, 262; *Watt E. D.*; *Comm. Prod. Ind.* 786; *Prain Beng. Pl.* 1050.—Vern. *Kela*. The Banana.—*Male fls.* and *bracts* deciduous. *Fruit* oblong, usually 3-gonous, yellowish or reddish when ripe, the pulp is soft and sweet and is edible uncooked.—Numerous forms or varieties of this subspecies are cultivated throughout the warmer parts of India, the quality of the fruit differing according to the climate. For further particulars see *Watt's Comm. Prod. India*.

**MUSA CHINENSIS**. *Sweet* in *Hort. Brit.* ed. 2 (1830) 596; *Cooke Fl. Bomb.* *ii*, 742. *M. Cavindishii*, *Lambert*.—Chinese or Dwarf banána.—Whole plant 4-6 ft. Leaves 6-8, forming a dense rosette, 2-3 ft. long and about 1 ft. broad, spreading, oblong; petioles short, stout, deeply channelled, with broad crisped green edges. *Spikes* dense, 1-2 ft. long; *bracts* reddish-brown. *Male fls.* persistent. *Fruit* 4-5 in. long, 6-angled, yellow, with a thick skin, the flavour insipid until dead ripe. A native of S. China and much cultivated in India and other tropical countries. In the Saharanpur district the fruit is ripened underground in earthenware vessels.

## CIX.—AMARYLLIDACEÆ.

Perennial herbs, rarely shrubs or undershrubs; rootstock a bulb tuber or corm, rarely an erect stock. *Leaves* radical, few or many. *Flowers* few or solitary, on terminal leafless scapes, often umbellate; bracts membranous or coloured, rarely herbaceous, the outer under the umbel 1-3, rarely many, the inflorescence occasionally racemose or panicled with scattered bracts. *Perianth* regular or irregular, 2-seriate, 6-lobed or partite, sometimes with a corona on the limb. *Stamens* 6, adnate to the base of the perianth-segments, rarely epigynous; filaments free or connate, anthers erect or versatile. *Ovary* inferior, 3-celled, style slender, stigma simple or 3-cleft; ovules many, 2-seriate on the inner angles of the cells, anatropous. *Fruit* inferior, usually a loculicidal capsule, rarely fleshy and bursting irregularly. *Seeds* few or many; albumen fleshy, enclosing the small embryo.—Species about 650, in temperate and tropical regions.

Leaves large, thick and fleshy, densely clustered at the top of a rootstock or a simple stem, spiny at the tip and usually armed along the edges; scape long, terminal, simple or branching towards the apex:—

Inflorescence simple and spicate or compound and thyrsoid; stamens in bud inflexed under the tips of the per-segments, much longer than the perianth; filaments filiform or flattened at the base; style filiform . . . . .

## 1. AGAVE.

Inflorescence loosely panicled; stamens about equalling the perianth; filaments thickened at the base; style thickened in the middle . . . . .

## 2. FURCREA.

Leaves thin and flat or, if somewhat fleshy, unarmed:—

Rootstock tuberous; leaves strongly nerved flat or plicate; flowers in spikes or racemes; perianth yellow not showy:—

Fruit opening by 3 valves or circumscissile . . . . .

## 3. HYPOXIS.

Fruit a succulent berry . . . . .

## 4. CUCULIGO

Rootstock a tunicate bulb; leaves not strongly nerved, flat, smooth; flowers usually umbellate at the apex of a scape; perianth white or pink, large and showy :—

Filaments attached to the perianth-lobes, but not connate . . . . .

5. CRINUM.

Filaments united towards their base by an intervening petaloid membrane . . . . .

6. PANCRATIUM.

1. AGAVE, Linn.—The following key to the species of *Agave* which are cultivated or have become naturalized in N. India is based on a paper in the Agricultural Ledger of 1906, No. 7, by Mr. J. J. R. Drummond and Sir David Prain :—

Leaves in section flat to concave, but never channelled throughout :—

Teeth minute, close set . . . . .

*Agave* species under letter A in D. & P. page 83.

Teeth larger, more or less remote :—

Leaves in a lax rosette or tufted, never less than 3 ft. long :—

Perianth-segments not constricted towards the tips :—

Leaves broadest in the middle, tapering to both ends :—

Leaves oblong-lanceolate, neck sharply constricted . . . . .

*Agave americana*,  
L. under letter B.  
in D. & P. page 84.

Leaves linear-oblong, neck not constricted :—

Marginal prickles of upper portion of leaf pointing upwards, leaf deeply trough-shaped in upper fourth . . . . .

*Agave* species, under letter C. in D. & P. page 85.

Marginal prickles pointing uniformly downwards; leaf flattish throughout . . . . .

*Agave Vera-Cruz*,  
Miller, under letter D in D. & P. page 86.

Leaves hardly widened in the middle, very narrow in proportion to length :—

Leaves linear-lanceolate, curving outwards throughout their length, terminal spine acicular . . . . .

*Agave Cantala*,  
Roxb. under letter E in D. & P. page 87.

Leaves narrowly oblong, not curving, stiff, erect; terminal spine conical from a stout base . . . . .

*Agave species* under letter F in D. & P. page 88.

Perianth-segments narrowed from the middle to the ligulate tip :—

Leaves straight . . . . .

*Agave sisalana*,  
Per. under letter G in D. & P. page 89.

Leaves drooping from their upper  $\frac{1}{2}$  or less . . . . .

*Agave species* under letter H in D. & P. page 90.

Leaves in a close globose rosette, never exceeding 3 ft. . . . .

*Agave Wightii* D. & P. under letter J, page 91.

Leaves in section channelled throughout. . . . .

*Agave decipiens*,  
Baker under letter K in D. & P. page 92.

### 1. AGAVE.

*Agave sp.* (A) D. & P. in *Agril. Ledger No. 7 (1906)*, p. 84.

This is supposed to be the same as a plant cultivated in the Saharanpur Bot. Garden under the erroneous name of "*A. Ixillii*." A plant reported to be naturalized in Burma seems to be very near to this, and is perhaps allied to *A. Keratto*, Miller. No information regarding the fibre is available, nor is the native country known.—Leaves deep-green with a glaucous bloom; marginal prickles minute, sharp, ruby-coloured when young, pointing both upwards and downwards; terminal spine brown, subulate.

*A. americana*, Linn. *Sp. Pl.* (ed. I), i, 323; *Bot. Mag. t.* 3654; *D. & P. l. c.* under *B.* page 84; *Cooke Fl. Bomb.* ii, 754.

The American Aloe. Planted in parks and large gardens throughout India, but not naturalized, nor grown for its fibre. Outside India it is cultivated as an ornamental plant in gardens in N. Europe and N. America. Its native country is not known. The plant widely naturalized and commonly termed *A. americana* in S. Europe, is believed by D. & P. to be *A. Vera-Cruz* of Miller.—Trunk prostrate or ascending; leaves deep-green often variegated with white or pale-yellow stripes or borders, sometimes rather glaucous; marginal prickles mostly pointing downwards; terminal spine dull-brown, 1-2 in. long; perianth-lobes obtuse, amber-coloured.

*A. sp. (c)*, *D. & P. l. c.* page 85.—

Considered to be closely allied to *A. Vera-Cruz*, Miller. It was formerly cultivated in the Saharanpur Bot. Gard. under the erroneous name of *A. Jacquiniana*. The plant was sent to Saharanpur from Europe but its native country is not known. The freshly cut leaves smell like rhubarb stalks, and their juice soon ferments.—Leaves oblong-linear from a very thick caudex, dark-green, glaucous; tips stiffly recurved; blade 6 ft. long or more and 8-12 in. at the widest part some way above the middle and there forming a deep trough by the bending of the leaf and the inward rolling of the margins; prickles very stout and black, those above the trough-like portion of the leaf spreading or ascending, the rest pointing downwards; terminal spine about  $\frac{1}{4}$  in. long, dark-coloured.

*A. Vera-Cruz*, Miller *Gard. Dict.* (ed. 8), No. 7; *D. & P. l. c.* (under *D.*) p. 86. *A. lurida* Zucc.; *Baker in Gard. Chron. N. S.* viii (1.877), 264 excl. var. *Jacquiniana* and ref. *A. Vera-Crucis*, Haw, *A. Cantula*, *Prain Beng. Pl.* 1057 (not of Roxb.).—

The common Grey Aloe of India.—Cultivated in Bot. Gardens from Calcutta as far as Lahore, also planted in hedges throughout the greater portion of India, and sometimes on the sides of railways, and it is said to be naturalized in Mysore. DISTRIB.: naturalized throughout S. Europe, in S. France and Mediterranean Islands, also in N. W. Africa and the Atlantic Islands (not recorded from S. E. Europe or the Orient). Extending to S. Africa, Mauritius and Ceylon. Its native country is probably Mexico.—Leaves linear-oblong, many from a short stout trunk which is hidden by their thickened bases, sage-green and often very glaucous, early curving upwards, the ends usually more or less recurved or drooping, 4-6 ft. long, often

rather concave at the widest part which is above the middle, neck hardly constricted; marginal prickless broad, stout, blackish, spreading or decurved; terminal spine  $\frac{1}{2}$ -1 in. long, dark-brown.

**A. Cantala, Roxb. Hort. Beng. 25; D. and P. (under E.), page 87.** *A. Cantula, Roxb. Fl. Ind. ii, 167*; not of Dalz. and Gibbs. which is *A. Wightii*, nor of Prairn which is *A. Vera-Cruz*, Miller.

Naturalized in many parts of India, extending from C. India to both E. and W. coasts to the N. W. Gangetic Plain and to the Sub-Siwalik tracts as far as the Ravi, absent in the arid strip between Gwalior and Delhi, where another species, the so-called *A. mexicana*, has found its way. (See under letter F in D. & P. I. c. p. 88.) It is also found in Burma. Its native country is not known for certain. This appears to be the first *Agave* to reach India, and it came probably from the Pacific coast of C. America. The fibre exported from Bombay with that of other species is often wrongly named *A. vivipara*. The freshly cut leaves smell like rhubarb.—Leaves linear-lanceolate in a lax but even tuft from a short ascending rootstock, pale-green or sometimes glaucous, very narrow in proportion to their length (4 ft. or more), the greatest width just above the middle being about 3 in., curving outwards gradually from their bases or bent over almost from their origin; upper surface more or less concave, sometimes trough-shaped in lower portions; marginal prickles large, alcate, always ascending,  $\frac{1}{2}$  in. or more long, very sharp, pale-brown or garnet-coloured, from a small light-coloured cushion; terminal spine, acicular, cylindrical, reddish or dark brown  $\frac{1}{2}$  in. long.

**A. sp. (F) D. and P. l. c. pages 88 and 101.**

According to D. and P. this species seems to be intermediate between *A. Cantala* and the *Sisalana* series. It differs from the former species by its stiff upright leaves which are never involute and hardly concave, do not bend outwards and are seldom recurved, even at the tips; also the flowers are more delicate in texture. Specimens were sent by Mr. Gamble to the Calcutta Bot. Gard. from Dehra Dun under the name of *A. mexicana*. It is planted and has become naturalized in many places within the Upper Gangetic Pl., and is often found in railway hedges in N. W. India. Its native country is not known. Further information is required regarding the quality of its fibre. Leaves tufted on a very short caudex, never forming a rosette, stiff erect, 4-5 ft. long, of uniform breadth and ending in the suddenly acuminate tip; marginal prickles distant, chestnut or garnet-coloured, their hooks sharp and ascending; terminal spine stout, conical,  $\frac{1}{2}$  in. long or more, brown.

*A. sisalana*, Perrine: *D. and P. l. c.* (under letter G), p. 89.  
True Sisal.—

The sisal-hemp was first known as a cultivated plant in Yucatan in 1834, whence it was introduced to Florida and there naturalized. From Florida it was brought to the W. India Islands and thence to India during the years 1885-1892. Its native country is not known for certain. It is cultivated in many parts of India as far north as Lahore, also in C. India, Bombay, Bengal, Mysore and Madras, also in Burma. Outside India it is grown in Australia, Fiji, Hawaii and E. Africa. Leaves 20-35, oblong-lanceolate, deep-green or sometimes glaucous, up to 6 ft. long, never forming a rosette, but closely tufted on the rhizome or on a short ascending caudex, neck not at all constricted; margins with or without prickles which, if present, are weak scattered and pale-coloured; terminal spine not channelled, glossy, purple or dark-brown.

*A. sp. D. and P. l. c.* page 90 (under letter H).

The finest of the naturalized Indian species of *Agave*. It is the large species which was wrongly named *A. lurida* at Saharanpur. Vern. *Rambanskora*. It is regarded by D. and P. as closely allied to the *Sisalana* group. It occurs in many parts of Bengal and in the Gangetic Plain as far north as Saharanpur where it has run wild in the Botanical Gardens. It flourishes under the same condition as *A. Wightii* and is often found with it in the same hedge. It is cultivated also in Dehra Dun, Lucknow, Madras and Burma and often becomes naturalized in hedges. Its native country is not known. The freshly cut leaves have the scent of rhubarb. More information is required as to the quality of the fibre. Leaves oblong-lanceolate, not forming a rosette, the inner ascending from the stout caudex, the ends recurved for about  $\frac{1}{4}$  of the total length and drooping, dull dark-green, often glaucous, reaching 7 ft. in length and 10 in. in breadth at the widest part; marginal prickles distant, stout, falcate, yellow-brown from a broad pale cushion; terminal spine not decurrent, stout, slightly recurved.

*A. Wightii*, D. and P. l. c. page 91 (under letter J). *A. vivipara*, Wight Ic. 2024; *Baker Gard. Chron. N. S. VIII* (1877), 780 excl. all syn. except Wight, not of Linn. nor of others). *Agave Cantula*, Dabz. & Gibbs. *Bomb. Fl.* (not of Roxb.).—

Vern. *Bánskora* (Saharanpur). Small Aloe of India. Cultivated and naturalized in the Upper Gang. Pl. at Moradabad, in Dehra Dun, Saharanpur Bot. Gard., and from Delhi northwards to Ludhiana. It is the only *Agave* in N. India which develops a conspicuous trunk.

Its native country is not known. A variegated form is often cultivated in gardens. D. and P. say that *A. Wightii* will doubtless hold its own as a hedge plant, especially in the drier provinces. The fibre is reported as good, but shorter than that of *A. sisulana*.—Leaves ensiform, linear-lanceolate, very many,  $2\frac{1}{2}$ -3 ft. long, and up to  $3\frac{1}{2}$  in. at its widest part, inserted in a compact series on a stout usually conspicuous trunk which is partly procumbent or throughout ascending, forming a stiff even rosette 3-5 ft. in diam., pale green or often tinged with ashy grey; base thin, broadly amplexicaul; marginal prickles rather weak, about  $\frac{1}{4}$  in. apart, usually consisting of a small brown cushion carrying a semi-transparent garnet-coloured spine which is often sharply recurved parallel to the leaf edge, but ending in a finely barbed hook pointing upwards; terminal spine about  $\frac{1}{2}$  in. long, pale, slightly decurrent.

**A. decipiens**, Baker in Kew Bull. July-Aug. 1893, No. ccvii  
D. & P. l. c. under letter K, p. 92.

False Sisal. Cultivated only in Bot. and Horticultural Gardens at Calcutta, Saharanpur and Lahore; naturalized in Florida with *A. sisulana*, Perrine; native country not known. Very near to *A. Ixtili*, Karwinski, a native of Yucatan.—Leaves fleshy, linear, stiff, in section canaliculate, glossy apple-green, 2-4 ft. long, widest just below the middle, forming a compact radiating tuft, of which the outer leaves are nearly at right angles with the axis, the inner ones making gradually an acuter angle; marginal prickles reddish brown small but sharp; terminal spine  $\frac{1}{2}$  in. long or more, not decurrent, blackish, very sharp, inclining backwards.

## 2. FURCRAEA, Vent.

Only one species of this genus has shown any tendency to become naturalized in India. This has usually been identified with *F. gigantea*, Vent. but its exact identification with that species has not been satisfactorily determined by Drummond and Prain for want of specimens of the inflorescence. It is planted and has become naturalized within the area of this flora and in most of the public gardens of India. It is often grown as a hedge plant and sometimes on the sides of railway lines. In Southern India it is known as the "Mauritius Hemp." The fibre is much used in N. India, but it is not known to what extent it is in cultivation for this purpose. (D. and P. l. c. pages 105 and 147.)

## 3. HYPOXIS, Linn.; Fl. Brit. Ind. vi, 277.

Herbs with a tuberous rootstock, or a tunicate membranous or fibrous corm. Leaves radical, narrow, strongly nerved. Flowers solitary, or racemed, or in umbels. Perianth rotate, 6-partite, sessile on the top of the ovary and persistent. Stamens 6, adnate to the base of and shorter than the perianth-segments, filaments short; anthers erect, dorsifixed. Ovary 3-celled; style short, columnar; stigmas 3, erect, stout, distinct or connate; ovules 2-seriate in each cell. Fruit a globose or oblong capsule, opening by 3 valves or circumscissilely. Seeds subglobose; testa crustaceous, shining, beaked at the tip.—Species about 50, chiefly in S. Africa.

*H. aurea*, Lour. Fl. Cochinch. 200; F. B. I. vi, 277; Prain Beng. Pl. 1058; Collett Fl. Siml. 516; Cooke Fl. Bomb. ii, 747. *H. minor*, Don. Prod. 53; Royle Ill. t. 91, f. 3.

A small dioecious herb. Rootstock subglobose or elongate, crowned with the fibrous remains of the old leaves. Leaves 6-12, subcoriaceous, keeled, 4-14 in. long, narrowly linear. Scapes 1-4, filiform, or 2-flowered, subglabrous or thinly clothed with pale-brown hairs; bracts setaceous. Perianth-segments  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, slightly hairy and yellow, the outer ones green outside. Anthers sagittate. Ovary clavate,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, clothed with short shining golden-brown hairs. Capsules with thin walls, ultimately 3-valved, crowned with the erect per-segments. Seeds black, finely tuberculate.

Abundant within the area of this flora along the Sub-Himalayan tracts of Pilibhit and N. Oudh; also in Bundelkhand.—DISTRIB.: Outer Himalaya from Kashmir to Sikkim up to 7,000 ft., and southwards through the hilly parts of Peninsular India; extending to Java, China, Japan and the Philippines.

## 4. CURCULIGO, Goertn.; Fl. Brit. Ind. vi, 278.

Herbs with a tuberous rootstock, or a tunicate fibrous corm. Leaves often large, lanceolate and plicate or linear and flat. Flowers often 1-sexual, the lower flowers usually 2-sexual, spicate racemose or subcapitate. Perianth 6-partite, usually produced above the ovary as a solid stipe and bearing the rotate limb. Stamens 6, adnate to the base of the perianth-lobes, filaments short; anthers linear, erect. Fruit a berry. Seeds subglobose, testa crustaceous, black, often beaked. Species about 12, in tropical and sub-tropical regions.

**C. orchoides**, Goërt. *Fruct.* i, 63, t. 13; Roxb.; *Fl. Ind.* ii, 144; *F. B. I.* vi, 279; Watt E. D.; *Prain Beng. Pl.* 1059; Cooke *Fl. Bomb.* ii, 748.—Vern. *Musali-kand* (Oudh), *Mushali* (Hind).

*Rootstock* tuberous, stout, with many fleshy root-fibres. *Leaves* membranous, sessile or stalked, 6-18 in. long, linear or linear-lanceolate plicate, glabrous or sparsely and softly hairy, the tips sometimes rooting when reaching the ground. *Scape* very short, clavate, flattened, the pedicels bracts and ovary hidden by the leaf and sheaths. *Flowers* bright yellow, distichous. *Per-segments*  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, elliptic-oblong, acute, hairy on the back. *Ovary* lanceolate; cells 6-8-ovuled. *Berry*  $\frac{1}{2}$  in. long, hypogeanous. *Seeds*  $\frac{1}{8}$  in. long; testa deeply grooved, black, shining.

Abundant in the Sub-Himalayan tracts of Pilibhit and N. Oudh, also in Merwara (Duthie, Burkill, etc.). *DISTRIB.*: Outer Him. ranges from Kumaon eastwards, Khasia Hills, Manipur, south to Bengal, W. Ghats, Konkon and Nilgiri Hills extending to Java, China and the Philippines. The black root, a kind of *musali* is ground and eaten like flour at Balrampur in N. Oudh (Burkill). The roots are also much used medicinally.

5. **CRINUM**, Linn.; *Fl. Brit. Ind.* vi, 280.

Herbs with large tunicate bulbs. *Leaves* long, ensiform or lorate. *Flowers* large, umbellate, sessile or nearly so, with 2 spathe-like bracts at the top of a long solid scape; bracteoles linear. *Perianth* funnel-shaped or almost salver-shaped; tube long, straight or incurved, cylindric or with a wide mouth; lobes 6, recurved or spreading or conniving. *Stamens* 6, adnate to the throat of perianth-tube; filaments free. *Ovary* 3-celled; ovules 2-many in each cell; style filiform; stigma small. *Fruit* a subglobose membranous or coriaceous capsule, bursting irregularly. *Seeds* few, large, testa thick; albumen copious. Species about 75, in Trop. Asia, Africa, Australia, and America, mostly on sea-coasts, and in India often found wild in rocky beds of rivers.

Perianth-tube straight, erect; lobes stellately patent; stamens spreading:—

Leaves 5 in. wide or wider; umbels 15-50 fid.; per-tube 3-4 in. long, equalling the linear lobes; neck of the very large bulb 4 in. or more across . . . . .

I. C. ASIATICUM.

Leaves 2 in. wide or less; umbels 6-12 fld.; neck of bulb 2.5 in. or less across:—

Bulb with a fusiform stoloniferous base; per-tube 2½-3 in. long, equaling the linear lobes, which much exceed the stamens . . . . .

2. C. DEFIXUM.

Bulb not stoloniferous; per-tube 3.5-4 in.; lobes lanceolate, about as long as the stamens . . . . .

Leaves obtuse or subacute; per-lobes 3.5-4 in. long, about as long as the tube . . . . .

3. C. PRATENSE.

Per-tube curved, declinate; lobes ascending; stamens declinate:—

Leaves 3-5 in. wide, margin scabrous, hardly waved; per-lobes oblong, almost white; anthers grey . . . . .

4. C. LATIFOLIUM.

Leaves 1.5-2 in. wide; linear lanceolate, margin smooth, distinctly undulate; per-lobes lanceolate, pinkish; anthers brown . . . . .

C. LATIFOLIUM var.  
ZEYLANICA.

Leaves ½-1 in. wide; umbels 6-12-fld.; perianth 2½-3 in. long . . . . .

2 C. defixum.

Perianth-lobes lanceolate; leaves 1-2 in. wide; flowers subsessile; bracts 2-3 in. long . . . . .

3 C. pratense.

Perianth funnel-shaped; tube curved; lobes ascending, oblong or lanceolate; stamens declinate; style longer than the filaments . . . . .

4 C. latifolium.

1. C. ASIATICUM, L.; F. B. I., vi, 280; Prain Beng. Pl. 1061; Cooke Fl. Bomb. ii, 749. C. toxicarium, Roxb. Fl. Ind. ii, 134.—Cult. within the area of this flora and throughout trop. India. Wild on the Chittagong coast and in the Sundarbans.

2. C. DEFIXUM, Ker. Gawl., F. B. I. vi, 281; Prain Beng. Pl. 1061; Cooke l. c. 749. C. asiaticum, Roxb. l. c. 127 (not of Linn.).—Cultivated within the area of this flora and in other parts of India. Probably wild in Bengal and in the Central Prov. in swamps and rocky beds of rivers.

3. *C. PRATENSE*, *Herbert* ; *F. B. I.* vi, 282 ; *Prain l. c. 1061* ; *Cooke l. c.*, 750. *C. longifolium*, *Roxb. l. c. 130*.—Plains of India and in Burma. Cult. only in Upp. Gang. Plain.

4. *C. LATIFOLIUM*, *Linn.* ; *Roxb.* ; 1 c. 137 ; *F. B. I.* vi, 283 ; *Prain l. c. 1061*.—Gardens generally in India, perhaps wild in Orissa and Chota Nagpur. *VAR. zeylanica*, *Herb.* ; *C. zeylanicum*, *Roxb. l. c. 138*.—In gardens in India, perhaps wild in Orissa.

**6. PANCRATIUM**, *Linn.* ; *Fl. Brit. Ind.* vi, 285.

Herbs with tunicate bulbs. *Leaves* linear or lanceolate, often 2-farious. *Flowers* large, solitary or umbellate, sessile or stalked within 1 or 2 membranous spathes ; *bracteoles* linear, hyaline. *Perianth* funnel-shaped ; tube usually long, widened at the mouth ; lobes 6, narrow, suberect, subequal. *Stamens* 6, shorter than perianth, adnate to the throat ; filaments, connate below in a petaloid membranous cup ; anthers dorsifixed. *Ovary* 3-celled ; ovules many, 2-seriate in each cell ; style long, filiform ; stigma small. *Fruit* a large subglobose 3-cornered loculicidally 3-valved capsule. *Seeds* many, angular ; testa thick, lax, black.—Species about 12, in S. Europe, Africa, and a few are cultivated in Indian gardens, and are often apparently wild within the area of this flora.

*Zephyranthes tubispatha* *Herbert* ; *F. B. I.* vi, 277 ; *Prain Beng. Pl. 1060*. A bulbous plant with white flowers. It was introduced into India from Peru, and is much grown in gardens, and has become naturalized as an escape in many parts of India. Another species, *Z. rosea* *Lindl.*, is also met with in Indian gardens, and in Dehra Dun it occurs as an escape from cultivation. It is wild in Cuba, and the flowers are red.

*Polianthes-tuberosa*, *Linn.* ; *Watt, E. D.* ; *Cooke Fl. Bomb. ii*, 753. A well-known garden plant within the area of this flora and in other parts of India. Roots tuberous ; flowering stems 3-4 ft. high ; flowers white and fragrant, in terminal racemes. Introduced from Mexico and known in India as the *Tuberose*.

**CX. DIOSCOREACEÆ.**

Large usually climbing herbs and generally with a thick fleshy tuberous underground rootstock, rarely a cluster of tuberous

roots, or with sometimes an epigæal and often woody tuber. *Leaves* alternate or opposite, simple or compound, costate and reticulate; petioles often angular and twisted at the base, sometimes articulate. *Flowers* small, usually 1-sexual, arranged in spikes or racemes, diœcious or monœcious in separate spikes, regular; bracts often minute, sometimes obsolete; male spikes or racemes simple or panicled; female simple, sometimes reduced to 1-2 flowers; perianth superior, MALE flowers: *Perianth* campanulate or rotate, deeply 6-fid or urceolate with narrow mouth and short spreading lobes. *Stamens* 6, inserted at the base of the perianth, all perfect or 3 reduced to staminodes, or only 3 and no staminodes, filaments incurved or recurved; anthers small, 2-celled, globose, oblong or didymous, or with the cells discrete on branches of the filament. *Pistillode* thick, columnar, 3-fid. or entire or obsolete. FEM. flowers: *Perianth* smaller than in male, 6-fid. or-partite, persistent. *Staminodes* 3, 6 or none. *Ovary* inferior, 3-quetrous, usually 3-celled; styles 3, very short; stigmas entire or 2-fid., recurved; Ovules 2 in each cell, superposed, pendulous. *Fruit* a berry or a 3-valved capsule. *Seeds* flat or globose; embryo small, enclosed in the fleshy and rather hard albumen.—Species about 160, in tropical and subtropical regions.—*Tamus communis*, L., the Black bryony, is a climbing plant with tuberous roots, and is frequently met with in hedges in many parts of Britain.

**DIOSCOREA.** Linn.; Fl. Brit. Ind. vi, 288.

Herbs with slender climbing, rarely procumbent, stems; tuber solitary, often large, underground or rarely epigæal, very rarely with clustered long-peduncled tubers at the base of stem. *Leaves* alternate or sometimes opposite, entire or lobed or digitately 3-9-foliate. *Flowers* 1-sexual and usually diœcious. MALE flowers: *Perianth* campanulate rotate or urceolate; lobes short, spreading. *Stamens* 6, free round a pistillode, or connate in a central column, or 3 alternating with 3 staminodes, or 3 without staminodes; anthers small, the cells contiguous or discrete. *Pistillode* thick and fleshy or none. FEM. flowers: *Perianth*-segments 6, small, free. *Staminodes* 6, 3 or none. *Ovary* 3-celled, stigmas reflexed above the style. *Fruit* a 3-cornered loculicidal capsule, the angles laterally flattened and almost winged. *Seeds* compressed, often with a large membranous wing; albumen fleshy or hard, 2-

laminate, embryo between the laminae with a suborbicular cotyledon.—Species about 150, in tropical and subtropical regions.—The tubers of *Dioscorea*, known as yams, contain much starch, and are largely cultivated in India and in other tropical countries.

The following key to the species of *Dioscorea* which occur either wild or cultivated within the area of this flora is based on Prain and Burkhill's Synopsis of the Dioscoreas of the Old World (Africa excluded) and was published in Journ. and Proc. As. Soc. Beng. (N. S.) Vol. X No. 1, 1914.

Stems twining to the left :—

Section COMBILLOM. Tubers produced in a bunch, spreading, edible. Leaves simple, cordate. Male flowers 1-2 together on a long spike-like raceme (when the 2nd flower is present it is placed cymosely on the pedicel of the 1st); perianth saucer-shaped, the stamens inserted near the margin. Seeds unknown :—

1. *D. aculeata*.

Section LASIOPHYTON. Tubers vertical. Leaves generally compound. Male flowers in spikes or spike-like racemes which are generally compound; perianth-lobes just united at the base, with the stamens inserted on them; filaments simple. Seeds winged on one side only, in elongated, reflexed or horizontal capsules :—

Male flowers not densely packed; stamens 3; leaflets 3 or 5 . . . . .

2. *D. pentaphylla*.

Male flowers densely packed; stamens 6; leaflets 3 . . . . .

3. *D. triphylla*.

Section OPSOPHYTON. Tubers vertical. Leaves simple, cordate. Male flowers in characteristic dependent spikes; perianth-lobes with the stamens inserted at their bases; filaments free. Seeds with the wing developed on one side only, in elongated reflexed capsules :—

Leaves alternate, ovate-cordate, drying green; flower-spikes long; tubers sometimes slightly elongating . . . . .

4. *D. bulbifera*.

Stems twining to the right; seeds with the wing developed all round:—

Section ENANTIOPHYLLUM. Tubers vertical, usually edible. Leaves simple. Male flowers sessile, on short axes, opening but a little way; perianth-lobes free, with the stamens inserted at their bases; filaments simple. Seeds in capsules which are not reflexed but face forwards:—

Male flowers in spikes arranged on elongate leafless branches:—

Flowers of male plant on axes which are never zigzag alive or dry; buds usually flattened at the base:—

Special flowering branches conspicuously shorter than the leaves; capsules often rather glaucous . . . . .

5. *D. Wallichii.*

Special flowering branches, when well-grown, longer than the leaves:—

Pubescence abundant on the leafless axes which bear the spikes of the closely packed male flowers which are covered with hairs, stamens 6 . . . . .

6. *D. anguina.*

Pubescence absent entirely:—

Leaves hastate, network conspicuous below . . . . .

7. *D. belophylla.*

Leaves cordate or ovate-cordate, thin, curling up on the midrib when drying; the first lateral pair of nerves rather close to the midrib . . . . .

8. *D. glabra.*

Flowers of male plant on axes which become zigzag either in life or when dry; stems acutely angled or winged . . . . .

9. *D. alata.*

#### Section COMBILIMUM.

1. *D. aculeata*, Linn. *Amoen. Acad.* iv (1754), 131; *Prain and Burkhill in Journ. As. Soc. Beng. (N.S.)*, Vol. x (1914); *D.*

*fasciculata*, Roxb. Fl. Ind. iii, 801; F. B. I. vi, 296. *D. sativa*, Linn. Sp. Pl. (1753), 1033 (in small part). *D. spinosa*, Roxb. ex Wall. Cat. (1832) 5103, letters A, D, E.

VAR. *spinosa*, P. and B. *Syn. Diosc.*, page 20.

Leaves more or less hairy; flowers rarely produced; tubers few, unequal, mixed with many fibrous roots, the uppermost of which are armed with spines which protect the tubers from the ravages of pigs and other animals.—This variety is widely cultivated within the area of this flora, and is often found wild.

VAR. *fasciculata*, P. and B. l.c. p. 20.

Leaves almost glabrous; flowers not developed; tubers ellipsoid, crowded, without spines.—Cultivated in the districts of Lucknow, Allahabad, Fyzabad, Jaunpur, Azamgarh, Ballia, Ghazipur and Benares. It is also grown in Java and in other of the Malay Islands.

#### Section LASIOPHYTON.

2. *D. pentaphylla*, Linn. Sp. Pl. (1753), 1032; *Prain Beng. Pl. 1066*; *Cooke Fl. Bomb. ii*, 757; *Prain and Burkhill l. c. p. 23*. *D. Jacquemontii*, F. B. I. vi (1892), 290. *D. triphylla*, Linn. Sp. Pl. (1753), 1032.

From Western India to the remotest parts of the Pacific, from the Himalaya and Yunnan southwards to Ceylon and to the islands in the Torres Straits.

VAR. *Suli*, *Prain and Burkhill l. c. page 23*.

Leaves grey, not shining.—Dehra Dun, Siwalik range, N. Oudh, Bundelkhand. DISTRIB. : Himalaya in Garhwal and Kumaon at low elevations, extending to the Khasia and Naga Hills.

VAR. *Cardonii*, P. and B. l. c. page 23.

Leaves sparsely clothed with reddish hairs; flowers small.—N. Oudh, Gorakhpur, Mirzapur. DISTRIB. : Ch. Nagpur, in the hilly portions.

VAR. *communis*, P. and B. l. c. page 23.—Vern. *Kánta-álu* (Hind.).

Tubers short, stiff, armed; flesh insipid, firm; leaflets 3 or 5, clothed with reddish hairs.—Common within the area of this flora, also in Burma.

3. *D. triphylla*, Linn. *Amaen. Acad.* iv (1754), 131; *Lamk. Encycl. Method.* iii (1789), 234; *Prain and Burkhill l. c.* p. 25. *D. daemona*, Roxb.; *Fl. Ind.* iii, (1832) 805; *F. B. I.* vi, 289; *Watt, E. D.*; *Prain Beng. Pl.* 1066; *Cooke Fl. Bomb.* ii, 756.

From India to New Guinea, occurring just within S. W. China and in Formosa. Linnæus in 1853 applied the name "triphylla" to a form of *D. pentaphylla*; in 1754 he applied it as Prain and Burkhill use it here.

VAR. *daemona*, *P. and B. l. c.* page 26.

A pubescent plant, common in India. Within the area of this flora it has been recorded by Burkhill from Saharanpur Government Garden, Siwalik range in the Mohand Pass, N. Oudh, Gorakhpur, Mirzapur, Gwalior and Bundelkhand. DISTRIBUT.: Central India and C. Provinces, extending to the less rainy portions of Java. Roxburgh says of *D. daemona* that the roots are dreadfully nauseous, even after being boiled.

#### Section OPSOPHYTON.

4. *D. bulbifera*, Linn. *Sp. Pl.* (1753), 1033; *Prain Beng. Pl.* 1066; *Cooke Fl. Bomb.* ii, 758; *Prain and Burkhill l. c.* p. 26. *D. crispata*, Roxb.; *Fl. Ind.* iii, 802. *D. heterophylla*, Roxb.; *Fl. Ind.* iii, 804. *D. oppositifolia*, Campbell Econ. Prod. *Chutia Nagpur* (1886) p. 7. *D. pulchella*, Roxb.; *Fl. Ind.* iii, 801. *D. sativa*, Thunb. *Fl. Jap.* 191; *F. B. I.* vi, 295; *Duthie in F. and G. Crops pt. iii*, 11. Plate lxxx.

From India to the remotest parts of the Pacific, ascending the Himalaya to 5,000 ft., and in S. China, in S. Japan, and in N. Australia. Introduced into Trop. America and Africa.

VAR. *vera*, *P. and B. l. c.* page 26; *D. pulchella*, Roxb., *l. c.* 801.

Tuber and bulbils short, acid; leaves shining on upper surface.—very common in Upper Gang. Plain.—Vern. *Rāt-ālu*.

VAR. *sativa*, *P. and B. l. c.*—Vern. *Rāt-ālu* (Hind).—

Tuber very small; bulbils large, nearly smooth, greenish-brown; leaves large, broadly ovate.—Cult. in India and on the shores of Pacific.—(Otaheite Potato).

Var *suavior*, *P. and B. l. c.* p. 26.

Tuber and bulbils scarcely acrid.—Cult. in India, and recorded from Jhansi.

VAR. *crispata*, *Prain Beng. Pl.* 1066; *Roxb. l. c.*, 802; *F. B. I. vi*, 296; *Watt E. D.*—Vern. *Zamin-kand*.—Cultivated in N. India and on Himalaya up to 5,000 ft.

### Section ENANTIOPHYLLUM.

5. *D. Wallichii*, *Hook f. F. B. I. vi*, 295; *Prain and Burkhill l. c. p. 31*. *D. aculeata*, *Linn. Sp. Pl.* (1753), 1033 in small part; *Prain Beng. Pl.* 1067. *D. sativa*, *Wall. Cat.* (1832) 5108, letters *A, B, and F.*

India in hilly parts of Malabar Coast; thence inland to Tapti river and through Bundelkhand and Ch. Nagpur to the Circars, extending to Burma.

VAR *vera*, *P. and B. l. c.* page 31.

Capsule slightly glaucous.—Bundelkhand at Lalitpur (Duthie No. 15245);

DISTRIB. : See above, and exclude Burma.

6. *D. anguina*, *Roxb.*; *Fl. Ind.* iii, 803; *Prain and Burkhill l. c. p. 32*. *D. spinosa*, *Wall. Cat* (1832) 5103, letters *G and H.*

India, in the Himalaya from C. Nepal eastwards; general where the moisture is sufficient on the south of the Ganges as far as Travancore (but not in Ceylon); Assam, northern Burma, Sumatra and Java.—I am indebted to Mr. Burkhill for the following localities within the area of the Upper Gang. Plain: Gorakhpur dist.; N. Oudh: in the Bahraich dist.; Bandelkhand: in the Jhansi and Banda districts; C. India: in the Bhopal and Indore districts.

7. *D. belophylla*, *Voigt Hort. Suburb. Calc.* (1845) 652; *Prain Beng. Pl.* 1067; *Prain and Burkhill l. c. p. 36*. *D. deltoides*, *Baden-Powell Punj. Prod.* i, 259 (in part). *D. glabra*, *Hk. f. in F. B. I. vi*, 294 (in part); *Collett Fl. Siml.* 519. *D. sagittata*, *Royce ex Voigt l. c. 653*. *D. sp.* *Aitch. Cat. Punj. and Sind Pl.* 148.

A species demanding less rain than most of the others; met with along the Himalaya towards the west as far as the Kashmir Valley, and found also on the Salt Range; eastwards, as far as is known, its distribution terminates in Sikkim; southwards it occurs on hill crests as far as the Nilgiri Range; and it has once been recorded from the Khasia Hills. It is common within the area of this flora, especially in Dehra Dun and on the Siwalik range, also in N. Oudh, Bandelkhand and in the Mirzapur district.—Vern. *Turhur, toree*. The tubers are much eaten.

8. *D. glabra*, Roxb.; *Fl. Ind.* iii, 803; *F. B. I.* vi, 294 (in chief part); *Prain and Burkhill. l. c. p. 37.* *D. nummularia*, Roxb.; *Fl. Ind.* iii, 803. *D. Wallichii*, Hk. *f. in F. B. I.* vi, 295 (in small part).—

India, south of the Ganges in the moister parts, the Himalaya from C. Nepal eastwards, the plains of Bengal and Assam, also in Burma and Siam, extending to the Malay Pen. and Islands eastwards to Java.

VAR. *vera*, B. and P. l. c. page 38.

Leaves ovate, thin, very glaucous on lower surface, tinged with red in drying.—Recorded from Dehra Dun (Duthie), and from the Kheri district of N. Oudh (Duthie's collector No. 22827 (a), and from the Gorakhpur district (Duthie's collector No. 22827).

9. *D. alata*, Linn. *Sp. Pl.* (1753), 1033; *F. B. I.* vi, 296, Watt E. D.; *Prain Beng. Pl.* 1067; *Prain and Burkhill l. c. p. 39.* *D. atropurpurea*, *globosa*, *purpurea*, and *rubella*, Roxb. *Fl. Ind.* iii, pp. 797-800.

Cultivated throughout the Tropics, wherever the rainfall is sufficient. It is certainly of eastern origin and was perhaps derived from *D. Hamiltonii*. In the W. Himalaya races exist, here classed under var. *Tarri*, which appear as if *D. belophylla* may possibly enter their composition. A plant widely cultivated is commonly polymorphic as regards the parts subjected to man's influence, and *D. alata* is no exception; it shows a great variety of forms of tuber \* \* \* *D. alata* sometimes flowers and very rarely fruits (Prain and Burkhill). Vern. Khám (Beng.).

VAR. *Tarri*, P. and B. l. c. p. 39.

Veins on lower surface of leaves conspicuous. Cult. in Kumaon and in the adjacent parts of the Himalaya.

VAR. *vera*, P. & B. l. c.

Veins less conspicuous.

#### CXI.—LILIACEÆ.

Herbs, rarely shrubs or small trees, with fibrous roots, or with a creeping rootstock or a bulb or corm. Leaves caudine or radical, sometimes none. Flowers usually 2-sexual, axillary Wr terminal, solitary or geminate or arranged in umbels, spikes, racemes,

panicles or fascicles ; bracts usually small and scarious, or spathe-like when the flowers are in umbels. *Perianth* herbaceous or petaloid, usually 6-merous in 2 series, rarely, 4- or 8- or 10-merous, imbricate or rarely valvate in bud. *Stamens* 6, rarely 3 or fewer, hypogynous or adnate to the perianth, filaments free or connate ; anthers oblong or linear, often dorsifixed. *Ovary* 3-celled, usually simple, often long, rarely short or none or with 3 styles ; ovules 2 or more, on the inner angles of the cells, anatropous rarely orthotropous. *Fruit* a capsule or berry, usually 3-celled. *Seeds* 1 or more, globose or flattened ; embryo small, terete, surrounded by the horny or fleshy albumen.—Species about 2,500, in all climates and countries.

Shrubs with perennial stems above ground ; fruit berry-like :—

Stems climbing or straggling ; leaves replaced by linear or needle-shaped scales (cladodes) . . . . .

1. ASPARAGUS.

Stems leafy, usually climbing ; leaves 3-5-nerved, reticulate-veined . . . . .

2. SMILAX.

Herbs with annual stems or scapes rising usually from underground perennial rootstocks corms or bulbs, rarely (in *Asphodelus*) the plant wholly annual :—

Underground perennial stems large in proportion to the roots :—

Aerial annual stem climbing, leafy ; leaves broad, with tendril-like tips ; perianth large, showy ; rootstock tuber-like, naked . . . . .

3. GLORIOSA.

Aerial annual stems or scapes erect ; leaves narrow ; rootstock a globose coated corm or bulb :—

Perennial stem a solid corm covered with brown sheaths ; annual stem leafy ; flowers solitary or corymbose

4. IPHIGENIA.

Perennial stem a tunicated bulb ; annual scape simple, naked ; leaves radical ; flowers racemose :—

Seeds sub-globose ; perianth stellate

5. SCILLA.

Seeds flattened ; perianth campanulate . . . . . 6. URGINEA.

Underground perennial stem very small or (in *Asphodelus*) sometimes none ; root-fibres large, many, usually some or all fleshy or tuberous ; leaves radical ; capsule loculicidal :—

Ovules 2 in each cell ; capsule 3-que-troous ; leaves  $\frac{1}{2}$ -terete or terete and fistular . . . . . 7. ASPHODELUS.

Ovules 4 or more in each cell ; capsule deeply 3-winged ; leaves flat . . . . . 8. CHLOROPHYTUM.

1. ASPARAGUS, Linn. ; Fl. Brit. Ind. vi, 314.

Undershrubs with a stout creeping rootstock. Stems erect, straggling or climbing, terete, grooved. Leaves minute, scale-like, bearing in their axils tufts of needle-like or flattened axillary cladodes. Flowers usually 2-sexual, small or minute, axillary, solitary fascicled or in racemes, pendulous ; pedicels jointed, bracts minute or obsolete. Perianth petaloid, 6-partite, campanulate or funnel-shaped. Stamens 6, adnate to the base of the perianth-segments, filaments free, anthers oblong. Ovary 3-gonous ; style columnar ; stigmas 3, recurved ; ovules 2 or more in each cell. Fruit a globose pulpy berry. Seeds few or solitary by abortion ; testa black, brittle, embryo dorsal, albumen hard.—Species about 100, in Europe Temp. and Trop. Asia and in Africa.

Branches 3-que-troous, smooth ; spines suberect or subrecurved,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long ; cladodes  $\frac{1}{2}$ -1 in. long, in tufts of 2-6, slender falcate, acuminate, channelled beneath ; ovules 6-8 in each cell.—A tall climbing much branched undershrub . . . . . 1. *A. racemosus*.

Stem tall, stout, smooth ; branches ashy-white, grooved and angled, the angles minutely scabrid ; spines stout, straight,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long ; cladodes in dense tufts of 6-20, slender, terete, filiform, soft ; ovules many in each cell.—A suberect shrub . . . . . 2. *A. adscendens*.

1. *A. racemosa*, Willd. *Sp. Pl.* ii, 152; *Roxb. Fl. Ind.* ii, 151; *F. B. I.* vi, 316; *Watt E. D.*; *Collett Fl. Siml.* 523; *Prain Beng. Pl.* 1070; *Kanjilal For. Fl.* (ed. 2) 409; *Gamble Man.* 724; *Brands Ind. Trees* 642.—Vern. *Satmuli* (Hind.), *Satrawal* (Dehra Dun), *Chatawal* (Rohilkhand), *Sahasmur* (N. Oudh).—Wild Asparagus.

A tall much-branched scandant spinous undershrub with tuberous roots. Stem woody, terete; branches 3-quetrous, smooth, striate; spines suberect or subrecurved,  $\frac{1}{2}$ -1 in. long. Cladodes  $\frac{1}{2}$ -1 in. long, in tufts of 2-6, spreading, falcate, acuminate, channelled beneath. Racemes solitary or in fascicles, 1-2 in. long, simple or branched; pedicels very slender,  $\frac{1}{6}$  in. long, jointed at the middle. Perianth  $\frac{1}{2}$ - $\frac{1}{3}$  in. diam.; lobes spreading. Anthers minute, purplish. Ovules 6-8 in each cell. Berry  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam.

Very common within the area of this flora, flowering after the rains, when it becomes conspicuous by its masses of white fragrant flowers.

DISTRIB.: Throughout trop. and subtrop. India, and in Ceylon, and up to 4,000 ft. on the Himalaya from Kashmir eastwards. It occurs also in Trop. Africa, Java and Australia. The white tuberous roots of this plant are collected for food and constitute a kind of white *muscati*. They are also used medicinally.

2. *A. adscendens*, Roxb. *Fl. Ind.* ii, 153; *Royle Ill.*, 393; *F. B. I.* vi, 317; *Watt E. D.*; *Collett Fl. Siml.* 523; *Kanjilal For. Fl.* (ed. 2) 409.—Vern. *Satāwa*, *sat-muli*.

A suberect prickly shrub, with white tuberous roots. Stems tall, stout, suberect, terete, smooth, white, much branched; branch-lets ascending, ashy-white grooved and angled, the angles minutely scabrid; spines  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, stout, straight. Cladodes in dense tufts of 6-20,  $\frac{1}{2}$ -2 in. long, slender, filiform, terete, soft, suberect or curved. Racemes 1-2 in. long, many-fld.; pedicels jointed above or below the middle; bracts minute. Flowers 1 in. in diam. Perianth—segments spreading. Ovules many in each cell. Berry  $\frac{1}{2}$ - $\frac{1}{2}$  in. diam. 1-seeded.

Dehra Dun, in Sal forests; Rohilkhand (T. Thomson) N. Oudh, in the districts of Kheri and Gonda (Duthie). DISTRIB.: Western Himalaya from Kumaon eastwards to Hazara, extending to Afghanistan. The tuberous roots are pickled, and the young shoots are eaten as a vegetable.

#### 2. SMILAX, Linn.; *Fl. Brit.* vi, 302.

Climbing shrubs rarely erect herbs, Leaves alternate, rarely opposite, persistent, 3-5-nerved and reticulate; petiole with

usually 2 tendrils above its base. *Flowers* small, diœcious, umbellate. *Perianth* of 6 free segments, incurved or recurved. **MALE** flowers: *Stamens* 6 or more, free from the base of the perianth; anthers oblong, 2-celled, didymous, cells contiguous or separated on a forked connective. *Pistillode* none. **FEM.** flowers: *Staminodes* 6 or 3. *Ovary* 3-gonous, style short or none; stigmas 3, stout, recurved; ovules 1 or 2 in each cell, orthotropous, pendulous. *Fruit* a globose berry. *Seeds* solitary, globose, often 2 and hemispheric, rarely 3; albumen horny, embryo small.—Species about 180, in temperate and tropical regions

Umbels 2-3, very rarely more, alternate on a common peduncle:—

Petiole stout, always narrowly sheathing but not auriculate below the middle . . . . .

1. *S. macrophylla*.

Petiole rather slender, with 2 large, thickly coriaceous, indistinctly reticulate auricles below the middle . . . . .

2. *S. Roxburghiana*.

Umbels 7-20, ternate or whorled on a common peduncle; petiole stout, with, in all except the uppermost leaves, 2 large leaf-like distinctly reticulate auricles below the middle . . . . .

3. *S. prolifera*.

1. ***S. macrophylla***. Roxb.; *Fl. Ind.* iii, 793 (no. of Willd.); *F. B. I.* vi, 310; *Watt E. D.*; *Prain Beng. Pl.* 1071; *Kanjilal For. Fl.* (ed. 2) 407; *Brandis Ind. Trees* 641; *Cooke Fl. Bomb.* ii, 763. *S. retusa*, Roxb. *Fl. Ind.* iii, 793. *S. ovalifolia*, Roxb. l. c. 794.—*Vern. Ramdatun*.

A large more or less prickly climber. *Stems* smooth, striate, armed with a few small distant prickles or almost unarmed. *Leaves* alternate, 3-8 in. long or sometimes much larger, broadly ovate or suborbicular, acuminate or cuspidate, glabrous, shining; main nerves usually 5, with reticulate venation between; petioles  $\frac{1}{2}$ -1 in. long, stout, narrowly sheathing, but not auriculate below the middle, tendrils very long and slender. *Umbels* 2-3, rarely more, alternate on a common peduncle, many fid.; peduncles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; bracts below the peduncles ovate, acute,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; pedicels of both male and female flowers arising from a mass of numerous minute bracts. **MALE** flowers: Pedicels  $\frac{1}{2}$  in. *Perianth*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; segments linear, obtuse, erect when young, afterwards reflexed, the 3 outer ones broader. *Stamens* about as long as the perianth. **FEM.** flowers: *Perianth* as in male; pedicels elongating in fruit. *Berry* about the size of a large pea, smooth, green and turning to red when ripe.

Sub-Himalayan tracts from Dehra Dun eastwards to Rohilkhand and N. Oudh and Gorakhpur; also in Sal forests on the Siwalik range. Flowers in the rainy season. *DISTRIB.* : Trop. Him. eastwards from Kumaon to Assam, Bengal and Burma, and south to Central Provinces and Konkan, extending to Java. The root of this plant is pounded and the flour is made into bread at Bulrampur in N. Oudh (Burkhill). The stem yields a strong fibre suitable for making brushes, and the thinner stems are much used as tooth-sticks (Kanjilal).

**2. S. Roxburghiana**, *Wall. Cat.* 5115; *F. B. I. vi*, 311; *Prain Beng. Pl.* 1071.

A large prickly climber with smooth terete branches, branchlets 4-angled. *Leaves* 5-8 in. long, oblong ovate or ovate-lanceolate, rounded cordate or cuneate at the base and with a bluntly acuminate tip, 3-5-costate from above the base; petiole rather slender, with 2 large coriaceous broad indistinctly reticulate auricles below the middle; the auricles of the old leaves 1-1½ in., produced behind into rounded lobes embracing the branch. *Umbels* many-flowered, 2-3 on a common peduncle, which is bracteate at the base. *Pedicels* of female flowers ½ in. long, slender. *Staminodes* 3. *Stigmas* long, recurved. *Berries* ½ in. in diam. *Seeds* 2, hemispheric, or solitary and globose.

Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). *DISTRIB.* : Trop. Himalaya from Garhwal eastwards; also in Bengal on Paras-náth, in Chota Nagpur, Chittagong and on the Khasia Hills.

**3. S. proliifera**, *Roxb. Fl. Ind.* iii, 795; *F. B. I. vi*, 312; *Watt E. D.*; *Prain Beng. Pl.* 1071; *Kanjilal For. Fl.* (ed. 2), 407; *Gamble Man.* 724; *Brandis Ind. Trees* 641. *S. laurifolia*, *Roxb. l. c.* 793. *S. ovalifolia*, *A. DC. Mon. i*, 199 (not of *Roxb.*).—*Vern. Rámdatoun* (Dehra Dun), *Kumári* (Behar).

A stout climbing shrub with prickly stem. *Leaves* variable, 4-5 in. long, oblong ovate or orbicular, coriaceous, nerves 3-7 from above the rounded or subcordate base; petiole 1-2 in. long, its sheath auricled at the base and amplexicaul round the stem; tendrils 2-4 in. long. *Umbels* 10 or more, many-flowered; peduncles ¾-1½ in. long; pedicels about ½ in. long. *Sepals* ½ in. long, oblong-lanceolate. *Petals* as long but narrower. *Stamens* as long as sepals. *Staminodes* of female flower 3. *Ovary* oblong; stigmas deciduous. *Berry* oblong or globose, red when ripe.

Common on the Siwalik range in the Dehra Dun and Saharanpur divisions and abundant in the Sub-Himalayan tracts eastwards chiefly in *sal* forests. Flowers in September and October, and the fruit

ripens from December to February.—DISTRIB.: Outer ranges of Himalaya in Kumaon; also in Bengal, Behar, Central India, Ceylon and Burma. The stems yield a strong fibre sometimes used for making brushes, and the thinner stems as tooth-sticks.

**3. GLORIOSA, Linn. ; Fl. Brit. Ind. vi, 358.**

Climbing herbs with leafy stems springing from a naked tuberous rootstock. Leaves alternate opposite or 3-nately whorled, lanceolate, strongly nerved and with a long spiral tendril-like apex. Flowers large, showy, solitary, axillary, pedicels reflexed. Perianth petaloid, persistent; segments 6, subequal, spreading or reflexed, margins undulate or crisped. Stamens 6, hypogynous; filaments filiform; anthers linear, dorsifixied, versatile, extrorse. Ovary 3-celled; style filiform, deflexed, with 3 subulate arms. Fruit a large coriaceous septicidal capsule. Seeds few, subglobose; testa spongy, wing-like, embryo cylindric.—Species 3 or 4, in Trop. Asia and Africa.

**G. superba, Linn. Sp. Pl. 305; Roxb. Fl. Ind. ii, 143; F. B. I. vi, 358; Watt E. D.; Prain Beng. Pl. 1073; Collett Fl. Siml. 530; Cooke Fl. Bomb. ii, 766.—Vern. Kulhári, languli, rájah-rar (Ajmir).**

A tall branching glabrous herbaceous climber. Rootstock a chain of arched fleshy cylindric tubers, 6-12 in. long, budding from the convex upper side; roots fibrous. Stem annual, leafy, 10-20 ft. long. Leaves sessile or nearly so, scattered or opposite, or sometimes ternately whorled, 3-8 in. long, ovate-lanceolate, acuminate, tip spirally twisted to form a tendril, base cordate. Flowers solitary or subcorymbose towards the ends of the branches, 3-4 in. across, persistent; pedicels 3-6 in. long, deflexed from the tip; perianth segments up to  $2\frac{1}{2}$  in. long, linear-lanceolate with crisply undulate margins, at first erect and greenish, afterwards becoming reflexed and turning to yellow or orange and finally scarlet. Filaments golden-yellow,  $1\frac{1}{2}$ - $1\frac{3}{4}$  in., spreading; anthers nearly  $\frac{1}{2}$  in. long. Style up to 2 in. long, the arms  $\frac{1}{2}$  in. Capsule linear-oblong, about  $1\frac{1}{4}$  in. long.

Common in Dehra Dun among bushes and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in the outskirts of forests, also in Bundelkhand and Merwara. Flowers June to October. DISTRIB.: Throughout Trop. India and in Ceylon, ascending to 5,000 ft. on the W. Himalaya, and extending to Malaya, Cochin China and Trop. Africa.

4. **IPHIGENIA**, Kunth. ; Fl. Brit. vi, 357.

Herbs with small tunicate corms and erect leafy slender stems. *Leaves* few, scattered, linear, the upper bract-like. *Flowers* small, erect, solitary or corymbose. *Perianth* petaloid, 6-partite, stellately spreading, deciduous; segments equal, narrow, clawed. *Stamens* 6, hypogynous; filaments short, flat; anthers oblong, versatile, introrse. *Ovary* sessile, 3-celled; styles 3, shortly connate below, linear, recurved, stigmatic within; ovules many in each cell. *Fruit* a loculicidal capsule. *Seeds* subglobose; testa thin; albumen fleshy; embryo small—species 4, in India, Africa, Australia and the Philippines.

**I. indica.** A. Gray in Kunth. *Enum.* iv, 213; *F. B. I.* vi, 357; Watt *E. D.*; Collett *Fl. Siml.* 529; Prain *Beng. Pl.* 1074; Cooke *Fl. Bomb.* ii, 766.

Corm  $\frac{1}{2}$ - $\frac{2}{3}$  in. in diam., narrowed into a short neck, tunicate with pale-brown sheaths. *Stems* up to 10 in. high. *Leaves* sessile, alternate, few, coriaceous, the lower ones 6-8 in. long, becoming smaller upwards, all linear, sheathing at the base; nerves obscure. *Flowers* appearing before the leaves, purple, few or many, in a terminal erect raceme; pedicels  $\frac{1}{2}$ -1 in. long; bracts linear or subulate, the lower leaf-like. *Perianth-segments*  $\frac{3}{8}$  in. long, narrow, clawed, spreading, at length reflexed. *Stamens*  $\frac{1}{6}$  in. long. *Ovary* oblong, about as long as stamens. *Capsule* oblong or subovoid,  $\frac{3}{8}$ - $\frac{5}{8}$  in. long, obtuse, 3-grooved. *Seeds*  $\frac{1}{16}$  in. in diam., brown.

Siwalik range (Duthie). **DISTRIB.** : Throughout India from the N.-W. Frontier to Burma, ascending Himalaya up to 7,000 ft. and to 4-5,000 ft. on Khasia hills; also in Ceylon and extending to Australia and the Philippines.

5. **SCILLA**, Linn. ; Fl. Brit. Ind. vi, 348.

Herbs with tunicate bulbs. *Leaves* radical, linear, lorate or oblong. *Flowers* racemose, on a simple leafless scape; bracts small. *Perianth* petaloid, persistent, stellate or campanulate; segments 6, subequal, often recurved. *Stamens* 6, adnate at or near the base of the perianth-segments; filaments usually filiform; anthers ovate or oblong, introrse. *Ovary* 3-celled; ovules few in each cell; style filiform, stigma small, capitate. *Fruit* a globose 3-lobed loculicidal capsule; cells 1-2-seeded. *Seeds* obovoid or subglobose; testa thin, black; embryo shorter than the firm albumen.—Species about 80, in Europe and Temp. Asia.

**S. indica.** Baker in Saund. Ref. Bot. iii, App. 12; F. B. I. vi, 348; Watt E. D.; Prain Beng. Pl. 1074; Cooke Fl. Bomb. ii, 767. Ledebouria hyacinthina, Roth; Bot. Mag. 3226.

*Bulb* ovoid or subglobose, 1-1½ in. in diam. *Leaves* appearing with the flowers, 3-6 in. long, oblong to lanceolate or oblanceolate, subacute, narrowed into a sheathing petiole, rather fleshy, undulate, obtusely keeled, sometimes rooting at the tips, dull-green above and often with darker blotches, paler and glaucous beneath. *Scape* 2-5 in. long, rather stout. *Flowers* greenish-purple, in cylindric many-flowered racemes 2-4 in. long. *bracts* minute, scarious; *pedicels* filiform,  $\frac{1}{4}$  to  $\frac{3}{4}$  in. *Perianth-segments*  $\frac{1}{6}$ - $\frac{1}{4}$  in. long, linear-oblong, obtuse. *Filaments*  $\frac{1}{6}$  in., purple; *anthers*  $\frac{1}{12}$  in. long, ellipsoid; style  $\frac{1}{6}$ - $\frac{1}{4}$  in. long. *Capsule*  $\frac{1}{6}$  long, membranous.

Bundelkhand (Royle); Gwalior (Maries). *DISTRIB.*: Behar, Chota Nagpur, Bombay Presidency and S. India to Ceylon; extending to Abyssinia.

**6. URGINEA.** Steinh.; Fl. Brit. Ind. vi, 347.

Herbs with tunicate bulbs. *Leaves* radical, linear or lorate. *Flowers* racemose or on a long leafless scape, often appearing before the leaves; *pedicels* short or long, articulate, *bracts* small. *Perianth* petaloid, campanulate; segments 6, subequal. *Stamens* 6, adnate at or near the base of the perianth-lobes, included; filaments filiform or thickened at the base; anthers oblong or linear, introrse. *Ovary* 3-celled, often, 3-gonous, style tapering towards the base, ovules many in each cell. *Fruit* an oblong 3-lobed capsule. *Seeds* usually many in each cell, compressed; testa black, marginally winged, embryo rather large, albumen fleshy.—Species about 24, in S. Europe, W. Asia and Africa.

**U. indica.** Kunth. Enum. iv, 333; F. B. I. vi, 347; Watt E. D.; Prain Beng. Pl. 1075; Collett Fl. Siml. 526. Kanjilal For. Fl. (ed. 2) 410; Cooke Fl. Bomb. ii, 768. *Scilla indica*, Roxb. ii, 147.—Vern. Kanda (Saharanpur), *jangli-piyáj*, uskil.—Indian Squill.

*Bulb* 2-4 in. long, ovoid. *Leaves* appearing after the flowers, 6-18 in. long, linear, acute, nearly flat. *Scape* erect, 12-18 in. long, brittle. *Flowers* distant, drooping or spreading, greenish-white; or dingy-brown; *bracts* minute, soon falling. *Perianth* campanulate; segments  $\frac{3}{4}$  in. long, oblong-lanceolate, obtuse, with 2 or 3 strong approximate median nerves. *Stamens*  $\frac{1}{2}$  in. or longer; filaments flattened.

## 7. ASPHODELUS, Linn. ; Fl. Brit. Ind. vi, 332.

*Style* obconic. *Capsule* ellipsoid,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; cells 6-9 seeded. *Seeds*  $\frac{1}{4}$  in. long flattened, elliptic, black.

Siwalik range (Stewart), also plentiful eastwards in the Sub-Himalayan tracts of Pilibhit and N. Oudh. *DISTRIB.* : W. Himalaya up to 7,000 ft. ; salt range of Punjab, and south to Konkan ; also in Burma, and Behar and in Chota Nagpur, extending to Trop. Africa. The bitter and nauseous bulbs are used as a substitute for the true *squill* (*U. maritima*), also by weavers in N. India to give substance to their thread.

Annual or perennial herbs with slender fleshy root-fibres. *Leaves* radical, linear, 3-quetrous or terete, fistular. *Flowers* racemose on a simple or branched leafless scape. *Perianth* petaloid, marcescent; segments 6, free or shortly connate below. *Stamens* 6, hypogynous, shorter than the perianth-lobes; filaments dilated at the base and embracing the ovary, the summit of the filament inserted in a pit on the back of the connective, anthers versatile. *Ovary* 3-celled, style filiform, stigma somewhat 3-lobed; ovules 2, collateral in each cell. *Fruit* a globose loculicidal capsule with rugose partitions. *Seeds* usually solitary in each cell; testa black, rugose, albumen cartilaginous, embryo rather large.—Species 6 or 7, in S. Europe and eastward to India.

*A. tenuifolius*, Cav. in *Anal. Cienc. Nat.* iii, 46, t. 27, fig. 2; *F. B. I.* vi, 332; *Watt E. D.*; *Collett Fl. Siml.* 524; *Prain Beng. Pl.* 1076; *Cooke Fl. Bomb.* ii, 770. *A. clavatus*, Roxb. *Fl. Ind.* ii, 148. *A. fistulosus*, Linn.—Vern. *Bokat-piázi*.

*Annual*. *Leaves* 6-12 in. long, terete, acute, sheathing at the base finely puberulous. *Scapes* several from the root, much branched above, 1-2 ft. *Flowers* white, laxly racemose, solitary in each bract; pedicels  $\frac{1}{2}$ - $\frac{1}{4}$  in., jointed below the middle; bracts  $\frac{1}{16}$  in., broadly ovate, boat-shaped, scarious, with a strong brownish keel. *Perianth*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long; segments oblong, obtuse, with a brownish costa. *Stamens*  $\frac{1}{2}$  in. long, acutely 3-gonous black.

Abundant within the area as a weed of cultivation and often becoming a peat. Flowers during the cold season. *DISTRIB.* : Plains of India in fields, and extending westwards to the Canary Islands and the Mediterranean region. The plant and seeds are sometimes eaten in India by famine-stricken people. (See Agricultural Ledger, No. 7, cf. 1902, p. 155.)

## S. CHLOROPHYTUM, Ker. ; Fl. Brit. Ind. vi, 333.

Herbs with a short hard rootstock emitting many fascicled roots, often thick and fleshy or tuber-like. *Leaves* radical, clustered, often broad, rarely linear or lorate. *Flowers* laxly racemed on a simple or branching leafless scape ; pedicels usually fascicled in the axils of small scarious or large membranous bracts. *Perianth* petaloid, marcescent or persistent, rarely deciduous ; lobes free, rotate. *Stamens* 6, hypogynous, free or the 3 inner adnate to the perianth-lobes, included ; filaments filiform, often widened above the middle, anthers oblong or linear, introrse, the filament inserted in a pit on the back of the connective. *Ovary* 3-quetrous, style filiform, stigma small, ovules 4 or more in each cell. *Fruit* a coriaceous truncate 3-quetrous loculicidal capsule. *Seeds* broad, usually compressed, rugose, testa black, albumen rather hard ; embryo often curved and rather large.—Species about 40, in tropical and sub-tropical regions.

*C. tuberosum*, Baker in *Journ. Linn. Soc. XV*, (1876), 332 ; *F. B. I.*, vi, 334 ; *Prain Beng. Pl. 1077* ; *Cooke Fl. Bomb. ii*, 772. *Anthericum tuberosum*, *Roxb. Fl. Ind. ii*, 149.

Root-fibres cylindric, with ellipsoid tubers hanging from them. *Leaves* sessile, membranous, usually ensiform, falcate, acuminate, recurved, 8 in. long or more ; margins crisped or undulate. *Scape* terete, naked, usually longer than the leaves. *Flowers* white, in simple or shortly branched racemes 2-4 in. long, bracts lanceolate, acuminate, the lower ones  $\frac{1}{2}$ - $\frac{3}{4}$  in. long ; pedicels ascending,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, jointed below the middle. *Per-segments* less than  $\frac{1}{3}$  in. long, oblong-lanceolate subacute, 7-9-nerved. *Stamens* shorter than the perianth ; anthers narrowly linear, afterwards twisted. *Capsule*  $\frac{2}{3}$  in. long, obovoid, emarginate, shining, transversely veined ; cells 4-6-seeded. *Seeds* black.

**Gorakhpur** (Vicary) : N. Oudh, in the districts of Gonda and Bahrach (Duthie). **DISTRI<sup>B</sup>.** : Behar and W. Bengal ; Central India and from the Konkan and N. Circars to Travancore, also in Burma and extending to Abyssinia.

*Allium*, Linn. ; Fl. Brit. Ind. vi, 337.—This genus contains over 250 species and is distributed in northern Temperate regions. The 27 species recorded in the F. B. I. as growing wild in India are nearly all confined to the Himalayan ranges. The cultivated kinds about 5, are briefly mentioned below.

Leaves fistular :—

Leaves basal only ; heads dense with flowers only . . . . . *A. asealonicum.*

Leaves subdistichous ; heads dense, with flowers and bulbils . . . . . *A. Cepa.*

Leaves flat :—

Heads bearing flowers only ; bulb long, cylindric, simple :—

Heads lax ; filaments simple, linear . . . . . *A. tuberosum.*

Heads dense ; filaments 2-toothed . . . . . *A. ampeloprasum.*

Head lax, bearing both flowers and bulbils ; bulb short, compound . . . . . *A. sativum.*

1. ***A. ascalonicum.*** Linn. ; Roxb. *Fl. Ind.* ii, 142, *F. B. I.* vi, 337 ; Watt *E. D.* ; A. DC. *L'Orig. Pl. Cult.* 55 ; Prain *Beng. Pl.* 1075 ; Cooke *Fl. Bomb.* ii, 775.—Vern. *Piyáj, Palandu* (The Shallot). Root consisting of a fascicle of several small ovate-oblong bulbs. Leaves basal only, fistular, shorter than the scapes. Scapes 1-2 ft. long, tapering from the swollen base. Umbels globular, dense, with flowers only.

2. ***A. Cepa.*** Linn. ; Roxb. *l. c.* ii, 142 ; *F. B. I.* vi, 337 ; Watt *E. D.* ; A. DC. *l. c.* 52 ; Duthie in *F. and G. Crops Pt.* iii, p. 5 ; Prain *Beng. Pl.* 1075 ; Cooke *Fl. Bomb.* ii, 775.—Vern. *Piyáj* (Onion).—Leaves fistular, bifarious. Umbels dense, with both flowers and bulbils—An important cold-season crop of Northern India.

3. ***A. tuberosum.*** Roxb. *l. c.* 141 ; *F. B. I.* vi, 343 ; Watt *E. D.* ; Prain *Beng. Pl.* 1076.—Vern. *Banga gandina* (Hind.) (Indian Leek). Bulb long, cylindric, simple. Leaves flat. Umbels lax, bearing flowers only. Filaments simple, linear. The plant is much cultivated in Bengal. Roxburgh states that the Hindus use it as an article of diet as leeks are in Europe.—Regel cites *A. tuberosum* as a synonym of *A. odorum*, L. and Sir Joseph Hooker has suggested that it might possibly be the cultivated form of that plant.

4. ***A. ampeloprasum.*** Linn. ; *F. B. I.* vi, 337 ; Prain *Beng. Pl.* 1076 ; Cooke *Fl. Bomb.* ii, 775. A. Porrum, L. ; Roxb. *l. c.* 141 ; Watt *E. D.* *A. ampeloprasum, var. Porrum, A. DC. L'Orig.*

*Pl. Cult. 81.*—Vern. *Gandina*—(The Leek). Leaves flat. Umbels dense, bearing flowers only: Filaments 2-toothed. Bulb long, cylindric, simple.

5. *A. sativum*, Linn.; Roxb. l. c. 142; F. B. I. vi, 337; Watt E. D.; Duthie in F. and G. Crops Pt. iii, 34, t. 66; Prain Beng. Pl. 1076; Cooke Fl. Bomb. ii, 775.—Vern. *Lasun* or *rasun* (Garlic). Leaves flat. Bulb short, compound. Umbels lax, bearing both flowers and bulbils.

## CXII.—PONTEDERIACEÆ.

Fresh-water and marsh herbs, erect or floating. Leafy stems 1-foliolate, springing from the buried rootstock or from the joints of the floating stem; basal leaves long-petioled, blade floating or upraised. *Flowers* 2-sexual, slightly irregular, arranged in racemes or spikes, rarely fascicled or in panicles at the ends of 1-leaved stems or branches; bract under the inflorescence spathe-like, bracts under the flowers minute or obsolete. *Perianth* inferior, petaloid, marcescent, usually tubular; lobes 6, sub-2-seriate, similar or the 3 inner smaller. *Stamens* 6 or 3, unequally adnate to the perianth tube or to the base of the perianth-lobes, usually declinate, the upper shorter, filaments free; anthers usually oblong, with 2 parallel distinct cells, dehiscence introrse, longitudinal or porous. *Ovary* free, 3-celled and with axile placentas, or 1-celled and with 3 parietal placentas, each placenta with many 2-seriate ovules, sometimes with only one fertile ovule in each cell, anatropous, pendulous or suspended, style filiform or columnar; stigma terminal, entire or lobed. *Fruit* a dry membranous loculicidally 3-valved capsule. *Seeds* ovoid or ellipsoid, small, testa longitudinally ribbed, albumen horny or floury; embryo central, cylindric.—Species about 36, found chiefly in Trop. Africa and America.

## MONOCHORIA, Presl.; Fl. Brit. Ind. vi, 362.

Aquatic herbs. *Rootstock* short or long, clothed with leaf-sheaths. *Leaves* radical and solitary at the top of the emerging stem or branches; radical long-petioled, all cordate-ovate, sagittate or lanceolate. *Flowers* in a raceme, sessile within the axil of the caudine leaf and fasciculately long-pedicelled, or pedunculate.

and subspicately short-pedicelled; spathe complicate below the raceme. *Perianth* campanulate, tube none; lobes 6, distinct, sub-equal. *Stamens* 6, adnate to the base of the perianth-lobes or hypogynous, one normally larger than the others and with its filament toothed on one side; anthers basifix, dehiscing by a terminal ultimately elongated slit. *Ovary* ovoid, sessile, 3-celled, with many ovules in each cell, style filiform, stigma minutely 3-lobed. *Fruit* an oblong membranous loculicidal capsule. *Seeds* many, ovoid, obtuse, many-ribbed, embryo cylindric in the centre of floury albumen.—Species about 6, in the tropics of the Old World.

Rootstock elongate, creeping; leaves hastate, sagittate or cordate; flowers on long stalks, subumbellate or racemose; inflorescence centrifugal . . . . . 1. *M. hastæfolia*.

Rootstock short, suberect; flowers on short stalks subspicate; inflorescence centripetal:—

Leaves ovate or ovate-cordate; flowers rather numerous . . . . . 2. *M. vaginalis*.

Leaves linear or narrowly ovate; flowers few . . . . . *M. vaginalis*, *V&B.*  
*plantaginea*.

1. ***M. hastæfolia*, Presl. Reliq. Hoenk. i, 128; F. B. I. vi, 362; Prain Beng. Pl. 1079; Cooke Fl. Bomb. ii, 777. Pontederia hastata, Linn.; Roxb.; Fl. Ind. ii, 121. P. sagitata, Roxb. l. c. 124. P. dilatata, Andr.; Roxb. l. c. 123. Vern. Laukia.**

*Rootstock* stout, creeping and rooting below, spongy, clothed with the remains of the old leaf-sheaths. *Leaves* 4-8 in. long, sagittate, hastate or cordate, smooth and glossy, many-nerved; petioles of floral leaves tumid above and embracing the short stout peduncle; petioles of radical leaves 1½-2 ft. long with a broad sheathing base. *Inflorescence* centrifugal. *Flowers* in racemes or subumbellate, crowded, bright purplish-blue; pedicels up to 1 in. long. *Perianth-segments*  $\frac{1}{2}$  in. long, becoming twisted round the fruit when withering; the 3 inner ones obovate and wider than the 3 oblong outer ones, all with 3 strong parallel median nerves and reticulately veined between them and towards the margins. *Filament* of large anther  $\frac{1}{8}$  in. long, with an acute horn at one side; anthers linear-oblong, the large one

blue, the others yellow. *Ovary* ovoid,  $\frac{1}{3}$  in. long; *stigma* obscurely 3-lobed. *Capsule*  $\frac{3}{5}$  in. long, ellipsoid. *Seeds*  $\frac{1}{10}$  in. long, rounded at each end, pale, with many fine brown ribs.

Abundant within the area in streams and tanks. *DISTRIB.* : Throughout India and in Ceylon, extending to the Malay Islands and China.

2. *M. vaginalis*, Presl. *Reliq. Hoenk.* i, 128. *F. B. I.* vi, 363; *Prain Beng. Pl.* 1079; *Cooke Fl. Bomb.* ii, 777. *Pontederia vaginalis*, *Burm.*; *Roxb. Fl. Ind.* ii, 121.

*Rootstock* short, suberect, spongy. *Leaves* very variable, 2-4 in. long, from linear to ovate or ovate-cordate, usually acuminate; petioles of lower leaves long, stout, terete; the peduncles emerging from the sheaths of the uppermost leaves. *Flowers* blue, usually spotted with red, in sub-spicate racemes globose in bud and then elongating as the flowers expand, the terminal flower opening first; pedicels  $\frac{1}{2}$ - $\frac{1}{4}$  in. *Perianth* campanulate; segments about  $\frac{3}{5}$  in. long, three of them narrowly obovate, the other three much narrower. *Filament* of large anther  $\frac{1}{2}$  in. long, with an acute horn on one side, those of the smaller anthers filiform. *Ovary*  $\frac{1}{10}$  in. long, ellipsoid, glandular; *stigma* 3-lobed. *Fruit* less than  $\frac{1}{2}$  in. long, glandular outside. *Seeds* rounded at each end, pale and with many brown ribs.

Abundant within the area in rice-fields, and on the margins of tanks. *DISTRIB.* : Throughout India from Kashmir to Assam and south to Travancore; also in Ceylon and extending to the Malay Islands, China, Japan and Trop. Africa.

*VAR. plantaginea*, *Solms-Laub.*; *F. B. I.* vi, 363; *Prain Beng. Pl.* 1079. *Pontederia plantaginea*, *Roxb. Fl. Ind.* ii, 123. A much smaller plant with narrower leaves and fewer flowers on the racemes. Found at Moradabad by T. Thomson and by Mrs. Bell at Banda, but is probably plentiful within the area and in other parts of India. Outside India it occurs in Java and China.

### CXIII.—COMMELINACEÆ.

Herbs, prostrate or erect, rarely climbing or shrubby. *Leaves* costate, with sheathing bases, nerves parallel. *Flowers* more or less irregular, usually 2-sexual, often cymose; cymes scorpioid, straight or reduced to one flower, sometimes panicled, often enclosed in spathe-like bracts; floral bracts usually small, opposite the pedicels or obsolete, sometimes herbaceous and distichously im-

briate. *Perianth* inferior, 6-partite ; the 3 outer segments herbageous, often persistent, the inner petaloid, free or united below in a tube, spreading above, marcescent. *Stamens* 6, adnate to the base of the perianth-segments, all perfect or 2 or more reduced to staminodes ; filaments often bearded with jointed hairs ; anthers oblong or globose, often dissimilar. *Ovary* free 3-or 2-celled, style terminal, stigma small ; ovules solitary or few, orthotropous, on the inner angles of the cells. *Fruit* a loculicidal capsule or indehiscent. *Seeds* angled, testa smooth or rugose, albumen floury ; embryo minute, far from hilum.—Species about 300, in tropical and subtropical regions.

Stamens 2 or 3, perfect, with 1-3 staminodes :—

Cymes enclosed in spathaceous bracts . . . . .	1. COMMELINA.
Cymes panicled ; bracts not spathaceous . . . . .	2. ANEILEMA.

Stamens 6, perfect :—

Petals united below into a tube ; cymes scorpioid . . . . .	3. CYANOTIS.
Petals free ; cymes secund, in thyrsoid panicles . . . . .	4. FLOSCOPA.

**1. Commelina, Linn. ; Fl. Brit. Ind. vi, 368.**

Herbs, usually slender or creeping below. *Leaves* ovate-lanceolate, or linear, with lax sheaths, petioled or not. *Flowers* in usually 2-fid. cymes emerging one at a time from a terminal complicate or funnel-shaped or hooded spathe ; flowers of the upper cyme-branch small, deciduous, of the lower fertile ; fruiting pedicel and capsule retracted within the spathe. *Sepals* 3, membranous, the 2 inner often connate at the base. *Petals* 3, longer than the sepals, one larger than the others and often clawed. *Stamens* 3, perfect, with 2-3 imperfect ; anthers oblong, one usually longer than the others. *Ovary* 3-rarely 2-celled, two of the cells 1 or 2-ovuled, third cell, if present, 1-ovuled or empty. *Fruit* a loculicidal capsule hidden in the spathe by the decurving of the pedicel after flowering, the posticus cell indehiscent or obsolete, or the 2 anticus cells empty indehiscent and connate as a ligulate body, from which the posterior cell falls away. *Seeds* ellipsoid or angled ; testa reticulate pitted

or rugose. Species about 100, in tropical and subtropical regions.

Anterior pair of cells of ovary 2-ovuled; posterior cell 1-ovuled or obsolete:—

Capsule 3-celled, the two anterior cells loculicidally dehiscent and each usually 2-seeded; posterior cell keeled, 1-seeded and deciduous at length dehiscent:—

Leaves lanceolate; spathes complicate, the margins free, or connate only at the very base:—

Seeds reticulate, cylindric; branches of cyme 1-3-fld.; spathe sometimes cordate at base . . . . .

Seeds smooth, truncate at one end; spathe always rounded at base:—

Branches of cyme equal, 1-2 fld.; seeds appended, globose at the unflattened end . . . . .

Branches of cyme unequal, upper 2-4 fld., lower 1-2 fld.; seeds with out appendages, subacute at the unflattened end . . . . .

Leaves elliptic-ovate; spathe turbinate; capsule always 5-seeded; seeds rugose . . . . .

Capsule 1-celled, with 2 superposed seeds truncate and appendaged at both ends, or with one subglobose seed; leaves linear; spathes deeply cordate at base . . . . .

All the cells of the ovary 1-ovuled; capsule 3-celled, subequally 3-valved; seeds free in the cells; spathe sessile or nearly so; capsule 3-gonous-obvoid . . . . .

**1. *C. nudiflora.*** Linn. *Sp. Pl.* 41; *Clarke in DC. Mon.* iii, 144; *F. B. I. v.*, 369; *Watt E.D.*; *Praen Beng. Pl.* 1082; *Cooke Fl. Bomb.* ii, 781. *C. cæspitosa*, *Roxb. Fl. Ind.* i, 174.

Diffuse, nearly glabrous; root fibrous. Stems 2-3 ft. or more long-branched from the base; branches prostrate or subscandent, often rooting at the rather distant nodes. Leaves sessile,  $1\frac{1}{2}$ -3 in. lanceo-

*1. C. nudiflora.*

*2. C. salicifolia.*

*3. C. Hasskarlii.*

*4. C. bengalensis.*

*5. C. attenuata.*

*6. C. obliqua.*

late or ovate-lanceolate, acute or acuminate; sheaths loose, glabrous, usually with ciliate margins. *Peduncles*  $\frac{1}{2}$ - $\frac{5}{8}$  in. long, spreading or erect. *Spathes*  $\frac{3}{4}$  or  $1\frac{1}{2}$  long; base rounded or cordate, with rounded lobes. *Cymes* usually two, 1-3 fid. *Flowers*  $\frac{1}{2}$ - $\frac{2}{3}$  in. across, the two interior petals obovate with long claws, dark blue; the exterior one subsessile, orbicular, pale blue or white, sometimes obsolete. *Ovary* 3-celled, of which two cells are 2-ovuled and the third 1-ovuled. *Capsule*  $\frac{1}{6}$  in. long, broadly oblong, acuminate, coriaceous, 5-seeded. *Seeds* oblong-cylindric, brown, tubercled and reticulate.

Abundant within the area. DISTRIB.: Throughout the hotter parts of India from the Punjab to Ceylon, extending to China, S. Africa and other tropical and subtropical countries.

2. *C. salicifolia*, Roxb.: *Fl. Ind.* i, 172; *Clarke in DC. Mon. iii*, 157; *F. B. I. vi*, 370; *Watt E.D.*; *Prain Beng. Pl.* 1082; *Cooke Fl. Bomb. ii*, 781.

*Stems* slender, glabrous, decumbent, sometimes rooting from the nodes. *Leaves* 3-6 in. long, linear-lanceolate, glabrous or nearly so; sheaths  $\frac{5}{8}$  in. to 1 in., ciliolate. *Spathes* 1-2 in., axillary ovate-lanceolate, acute or acuminate, rounded at base. *Peduncles*  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, slender. *Flowers* polygamous; branches of cyme equal, usually 1-2-fid. *Sepals* free, ovate, obtuse, the two inner connate below, larger than the outer. *Petals* dark blue, the two larger ovate with undulate margins and long claws, the smaller one broadly ovate, entire, subsessile or with a very short claw. *Staminodes* 3, clavate. *Capsule*  $\frac{1}{6}$  in. long, quadrate, membranous. *Seeds*  $\frac{1}{8}$  in. long, black, powdered with white, smooth, ovoid or subglobose, with a whitish membranous appendage at one end.

Dehra Dun, on the Siwalik range; Sub-Himalayan tracts of N. Oudh; Merwâra in Rajputana; Bundelkand. DISTRIB.: Eastwards to Assam, Burma and Bengal and southwards to the Konkan and S. India, extending to Java.

3. *C. Haasskarlii*, Clarke *Comm. and Cyrt. Beng.* 13, t. 3; in *DC. Mon. iii*, 157; *F. B. I. vi*, 370; *Prain. Beng. Pl.* 1082; *Cooke Fl. Bomb. ii*, 781.

*Stem* much branched, glabrous or pubescent, sometimes scaberulous. *Leaves* 1-3 in. long, narrowly lanceolate, subacute; sheaths  $\frac{1}{2}$  in. long, with a broad base, ciliate. *Spathes*  $\frac{1}{2}$  in. long, axillary, ovate-lanceolate, cordate at the base and with rounded lobes, glabrous scabrid or hispid; peduncles  $\frac{1}{2}$ -1 in. long. *Flowers* in pubescent unequal cymes, the uppermost branch 2-4-fid., the lower 1-2-fid. *Capsule*  $\frac{1}{6}$  in. long, quadrate, apiculate, membranous. *Seeds*  $\frac{1}{8}$ - $\frac{1}{6}$  in.

long, cylindric, truncate at one end, subacute or rounded at the other, without an appendage.

From Delhi to N. Oudh, apparently not common. DISTRIB. : Kumaon, Bengal, Assam ; and from Mt. Abu south to Konkan and Poona.

4. *C. benghalensis*, Linn. Sp. Pl. 41 ; Clarke in DC. Mon. iii, 159 ; Roob. Fl. Ind. 1,171 ; F. B. I. vi, 370 ; Watt E. D. ; Collett Fl. Siml. 532 ; Prain Beng. Pl. 1082 ; Cooke Fl. Bomb. ii, 782.

Stems 2-3 ft. long, slender, dichotomously branched from the base ; branches diffuse, glabrous or pubescent, creeping and rooting below. Leaves 1-3 in. long, ovate or oblong, obtuse, sessile or shortly stalked, pubescent or villous on both surfaces ; base unequal-sided, rounded cuneate or cordate ; nerves 7-11 pairs ; sheaths hairy ; margins ciliate with rufous hairs. Spathes 1-3 together, funnel-shaped or turbinate, auricled on one side. Sepals small, oblong, hairy. Petals blue, the larger one orbicular or transversely oblong. Ovary 3-celled, two of the cells 2-ovuled, the third cell 1-ovuled. Capsule  $\frac{1}{4}$  in. long, pyriform, membranous, 5-seeded. Seeds closely pitted.

Moradabad (T. Thomson), Pilibhit (Duthie) ; Bundelkhand (Edgeworth). DISTRIB. : Throughout India, and up to 6,000 ft. on the Himalaya, extending to China and Trop. Africa. In this species ripe seeds are sometimes matured underground from abnormal flowers borne on leafless branches coming from the lower nodes of the stems. These flowers are white and smaller than the blue aerial ones, which often fail to produce fertile seeds.

5. *C. attenuata*, Koen. ex Vahl. Enum. n, 168 ; Clarke in DC. Mon. iii, 172 ; F. B. I. vi, 372 ; Prain. Beng. Pl. 1083 ; Cooke Fl. Bomb. ii, 784.

Stem 1-3 ft. long, slender, much branched, glabrous or sparsely hairy. Leaves 1 $\frac{1}{2}$ -3 in. long, linear or linear-lanceolate, acute or subobtuse ; sheaths ciliate, often hardly distinct from the leaf-blade, spathes 1-1 $\frac{1}{2}$  in., narrowly ovate-lanceolate, acute or caudate-acuminate, glabrous ; base deeply sagittately cordate and with large auricles. Peduncles  $\frac{3}{4}$ -1 $\frac{1}{2}$  in., glabrous or pubescent. Flowers small, blue. Capsule  $\frac{1}{4}$  in. long, 1-celled, with 2 superposed seeds truncate and appendaged at both ends, or with one subglobose seed.

Bundelkhand (Mrs. Bell) and probably in other localities within the area. DISTRIB. : Chota Nagpur, Behar, Central India and South to Ceylon.

6. *C. obliqua*, Buch-Ham. in Don. Prod. 45 (not of Vahl), Clarke in DC. Mon. iii, 178 ; F. B. I. vi, 372 ; Watt E. D. ; Collett Fl.

*Siml. 532*; *Prain Beng. Pl. 1083*; *Cooke Fl. Bomb. ii, 784*. *C. communis*, *Roxb. Fl. Ind. i, 171*? *C. gelatinosa*, *Edgew.*

A tall branching herb. *Stems* 2-3 ft. high, stout. *Leaves* 4-7 in. long, very variable, sessile or stalked, lanceolate or elliptic-lanceolate, acute or caudate-acuminate, membranous, glabrous scabrous or villous; sheaths about 1 in. long, the mouth bearded with long hairs. *Spathes* sessile or nearly so,  $\frac{3}{4}$ -1 in. long and as broad as long, solitary or crowded in terminal heads, acute, funnel-shaped, glabrous or somewhat scabrous, usually filled with a clear, glutinous liquid. *Flowers* blue, about  $\frac{2}{3}$  in. across, in simple racemes; large petal orbicular, clawed. *Ovary* 3-celled, the cells 1-ovuled. *Capsule*  $\frac{2}{3}$  in. long, 3-celled and subsequently 3-valved, 3-gonous-ovoid. *Seeds*  $\frac{1}{4}$  in. long, oblong or ellipsoid, smooth, puberulous, lead-coloured.

Very common within the area. *DISTRIB.*: Throughout India and in Ceylon, and up to 6,000 ft. on the Himalaya; it extends also to the Malay Islands.

## 2. ANEILEMA, R. Br.; Fl. Brit. Ind. vi, 374.

Herbs with simple or branched stems; roots often tuberous. *Leaves* usually alternate, sometimes all radical, occasionally clustered under the inflorescence, usually narrow and sessile. *Flowers* in axillary and terminal panicles: bracts not spathaceous; bracteoles small. *Sepals* 3, free, membranous. *Petals* 3, obovate, equal. *Stamens* 2 or 3, filaments naked or bearded; anthers oblong, one usually smaller or longer than the others. *Staminodes* 2-4; rarely with minute anthers. *Ovary* sessile, 2-3-celled. *Fruit* a loculicidal capsule. *Seeds* 1 or more in each cell, with a thick hard rugose or pitted testa.—Species about 60, in tropical and subtropical regions, chiefly in Asia.

Cells of ovary containing 2 or more ovules, of the capsule 2-or more-seeded:—

Seeds 1-seriate in each cell; flowers in terminal or subterminal panicles:—

Cells of the ovary with 3 or more ovules, of the capsule 3-7-seeded:—

Panicles terminating an erect leafless scape with large sheathing bracts; leaves all radical, narrowly ensiform; root tuberous . . . . .

1. *A. scapiflorum*.

Panicles terminating leafy stems; root fibrous; stem slender; leaves sessile, small, oblong, auricled; panicle small, leafy below . . . . .

2. *A. spiratum.*

Cells of ovary with 2 ovules, of capsule usually 2-seeded; panicles subterminal rarely axillary; leaves linear or lanceolate . . . . .

3. *A. nudiflorum.*

Seeds 2-seriate (16 or more in each cell); pedicels axillary or terminal; stem stout, sparingly branched, creeping and rooting at the nodes, leafy; leaves linear-oblong . . . . .

4. *A. Hamiltonianum.*

Cells of ovary 1-ovuled, those of capsule 1-seeded; pedicels 1-3 in the axils of distant lanceolate bracts; stem slender, decumbent and rooting at the lower nodes; leaves long, linear; roots fibrous . . . . .

5. *A. vaginalatum.*

1. *A. scapiflorum*, Wight Ic. t. 2075; F. B. I. vi 375; Clarke in DC. Mon. iii, 207; Watt E. D.; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 786. *Commelina scapiflora*, Roxb. Fl. Ind. i, 175. *Murdannia tuberosa* Royle Ill. 403, t. 95.—Vern. *Siyah musli* (Hind.).

A tufted herb, with elongate fusiform tubers. Leaves all radical, erect, 4-8 in. long, narrowly ensiform, finely acuminate and slightly narrowed to the base. Flowers in erect elongate panicles on terminal leafless scapes; scape with panicle 8-18 in. long; sheaths on scape below the panicle  $\frac{1}{2}$ - $\frac{1}{4}$  in. embracing the scape, finely acuminate with an oblique mouth; upper bracts amplexicaul, often spotted. Sepals  $\frac{1}{2}$  in. long, elliptic-oblong, subacute, purple-green. Petals blue,  $\frac{3}{4}$  in. long, obovate. Stamens 3, perfect, all bearded with blue hairs. Capsule  $\frac{1}{2}$  in. long, ovoid. Seeds 5 or 6 in each cell, superposed, sharply 3-gonous.

Siwalik range, on the Mohand Pass and in Sub-Himalayan tracts from Rohilkhand to Gorakhpur (Duthie). DISTRIB.: Temp. and Trop. Himalaya from the Ganges eastwards to Bhutan; also in Bengal and southwards to Travancore and Ceylon, extending to Burma and China.

2. *A. spiratum*, R. Br. Prod. 271; Clarke in DC. Mon. 207; F. B. I. vi, 377; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 787. *A. nanum*, Kunth; Clarke Comm. and Cyrt. Beng. t. 18. *Commelina nana*, Roxb. Fl. Ind. i, 173. *C. pumila* Herb. Royle.

A dwarf annual, with fibrous roots, branching from the base; branches 6-10 in., decumbent and rooting below. Leaves sessile, the lower ones broadly linear-lanceolate; the upper oblong; cordate, amplexicant,  $\frac{1}{2}$ -1 in. long, acute; sheaths very short. Flowers about  $\frac{1}{2}$  in. across, in dichotomously branched few-flld. panicles; peduncles terminal and from the upper axils; pedicels longer than the capsules; bracts minute, ovate, amplexicaul, persistent. Stamens 3, perfect; anthers blue, filaments bearded; staminodes 3, shorter than stamens, usually naked. Ovary 3-celled, cells many-ovuled. Capsule 3-gonous, the cells 3-7-seeded. Seeds 1-seriate, minute, pale.

Banda (Edgeworth, under *Commelina nana*). DISTRIB.: Throughout India and in Ceylon, extending to Malaya and China, flowering during the rains. This plant will probably be found in other localities within the area of this flora. It appears to be common in Bengal as a field weed.

**3. A. nudiflorum**, R. Br. Prod. 271 (in note); Clarke in DC. Mon. iii, 210; F. B. I. vi, 378; Collett Fl. Siml. 538; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 788. A. radicans, Don Prod. 45 (in part). *Commelina nudiflora*, L. Mant. 177 (not of *Sp. Pl.*); Roxb. Fl. Ind. i, 173.

Roots fibrous. Stem simple or branched from the base; branches 6-12 in., procumbent and often rooting at the nodes. Leaves 2-5 in. long, linear-oblong or lanceolate, acute or acuminate, flat, glabrous or sparingly villous, base cordate rounded or narrowed into the sheath; sheaths hairy, the margins and mouth strongly ciliate. Flowers in subglobose or subcorymbose cymes at the ends of the branches of a terminal (rarely axillary) panicle; pedicels  $\frac{1}{2}$ - $\frac{1}{3}$  in. long; bracts boat-shaped, caducous. Sepals  $\frac{1}{8}$  in. long, oblong, obtuse. Petals equal, suborbicular, blue or purple. Stamens 2 perfect, 2-4 sterile, filaments or perfect stamens only or all bearded with moniliform blue hairs. Ovary 3-celled; cells 2-ovuled. Capsule  $\frac{1}{3}$  in. long, subglobose, mucronate, 3-celled, with 3 seeds in each cell. Seeds 1-seriate, tuberculate, dark brown, truncate at one end, rounded at the other; inner face angular, outer face convex.

Dehra Dun and Saharanpur districts; Bundelkhand (Edgeworth), flowering during the rains. DISTRIB.: Throughout India and on the W. Himalaya up to 6,000 ft.; Khasia Hills and Burma, and from Bengal and Bombay southwards to Ceylon, extending to China and the Malay Islands.

**4. A. Hamiltoniana**, Wall. Cat. 5222; F. B. I. vi, 380; Prain Beng. Pl. 1084; *Dichæspermum Blumei*, Hassk.; Clarke Comm. and Cyri. Beng. t. 27.

*Stem* 6-12 in. long, creeping and rooting at the nodes, leafy, sparingly branched. *Leaves* sessile, flat,  $1\frac{1}{2}$ -2 in. long; linear-oblong, acute or subacute, glabrate, base cuneate. *Peduncles*  $\frac{1}{2}$ -1 in., rigid; pedicels axillary or terminal. *Petals* white or pink. *Filaments* all naked. *Capsule* linear-oblong, acute,  $\frac{1}{2}$ -1 in. long, *Seeds* 2-seriate, about 16 or more in each cell, scabrid or flocculent.

Upper Gangetic Plain, usually in wet ground; Moradabad (T. Thomson).  
DISTRIB. : Eastwards to Bengal and Assam and extending to Java.

5. *A. vaginatum*, R. Br. Prod. 271; Clarke in DC. Mon. iii, 216; F. B. vi, 381; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 79.

Root fibrous, the fibres stout and almost fleshy. *Stem* decumbent, 6-18 in. long, rooting at the lower nodes, very slender, flaccid; branches suberect, ending in filiform peduncles with distant bracts. *Leaves* 3-8 in. long, linear, acuminate, flat; sheaths short, open, ciliate. *Flowers* small, 1-3, fascicled in the axils of distant bracts along the filiform terminations of the branches; bracts  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, strongly ribbed; pedicels very slender, puberulous, usually twice-jointed. *Sepals*  $\frac{1}{2}$  in. long, obtuse. *Petals* orbicular, blue. *Stamens* 2, perfect, and with bearded filaments; sterile stamens 3-4, usually naked and shorter. *Ovary* 2-celled; cells 1-ovuled. *Capsule* globose, cuspidate; cells 1-seeded or empty. *Seeds* 3-gonously conic, truncate at one end narrowed at the other, slightly rugose, black.

Common in rice fields and wet places. DISTRIB. : Throughout Trop. India and in Ceylon, extending to China.

### 3. CYANOTIS, Don; Fl. Brit. Ind. vi, 384.

Herbs, prostrate or creeping. *Leaves* small. *Flowers* in axillary and terminal scorpioid cymes, formed of large imbricate 2-seriate secund foliaceous falcate bracteoles, the petals and stamens alone exserted, rarely with the corolla-tube exserted; flowers sometimes in exposed racemes or fascicled in the ochreate leaf-sheath. *Sepals* 3, subequal, free or connate below. *Petals* 3, subequal, often united in a tube below, limb orbicular. *Stamens* 6, all perfect, subequal, hypogynous or epigynous; filaments usually bearded, often inflated towards the apex, anthers oblong. *Ovary* 3-celled; ovules 2 in each cell, collateral, one erect the other pendulous. *Fruit* a 3-celled loculicidal capsule. *Seeds* usually 2 in each cell, superposed, cubical or pyramidal, usually rugose.—Species 35,

in the warmer regions of the Old World, from Africa and through India to S. China and N. Australia.

Flowers in cymes, enclosed in 2-seriate falcate imbricating bracteoles :—

Roots fibrous ; stem and branches slender ; leaves ovate-oblong, glabrous or with spreading hairs . . . . . 1. *C. cristata*.

Roots tuberous ; stem and branches stout ; radical leaves ensiform ; caudine lanceolate, hirsute . . . . . 2. *C. tuberosa*, VAR. *adscendens*.

Flowers axillary, enclosed in the sheaths of the leaves ; bracteoles small, slender, not imbricating . . . . . 3. *C. axillaris*.

**1. *C. cristata***, Schult. f. *Syst. vii*, 1150 ; Clarke in *DC. Mon. iii*, 247 ; *F. B. I. vi*, 385 ; Collett *Fl. Siml.* 534 ; *Prain Beng. Pl. 1085* ; Cooke *Fl. Bomb. ii*, 794. *Tradescantia imbricata*, Roxb. *Fl. Ind. ii*, 120.

A slender branching herb with fibrous roots. Stem branched from the base ; branches 6-18 in. long, creeping and rooting below, glabrous or with spreading hairs. Leaves sessile, ovate-oblong, flat, glabrous or sparsely hairy, the margins softly ciliate, base rounded or cordate ; sheaths short, hairy. Flowers in scorpioid recurved cymes which are longer than the bracteoles ; peduncles  $\frac{1}{2}$ -4 in. long ; bracts leaflike,  $\frac{2}{3}$ -1 $\frac{1}{2}$  in. long, ovate, cordate, acuminate, ciliate ; bracteoles  $\frac{1}{2}$  in. long, glabrous or ciliate with long hairs. Sepals lanceolate, acuminate. Filaments bearded above. Style naked. Capsule  $\frac{3}{5}$ - $\frac{8}{5}$  in. oblong, 3-gonous, truncate, nearly glabrous. Seeds  $\frac{1}{5}$  in. long, striate and with 2 large pits on two of the faces, black.

Bundelkhand (Edgeworth under *C. imbricata*). DISTRIB. : Throughout Trop. India, in hilly districts, and up to 4,000 ft. on the W. Himalaya ; also in Burma, Ceylon, and Malay Islands, extending to Trop. Africa.

**2. *C. tuberosa***, Schult. f. *Syst. vii*, 1153, VAR. *adscendens*, Clarke in *DC. Mon. iii*, 249 ; *F. B. I.*, 386 ; Watt *E. D.* ; *Prain Beng. Pl. 1085* ; Cooke *Fl. Bomb. ii*, 793. *Tradescantia tuberosa*, Roxb. *Fl. Ind. ii*, 119.

A creeping herb, with proliferous rooting nodes. Root of fusiform tubers. Stem up to 3 ft. long, swollen and hairy at the base. Leaves sessile, the radical and lower caudine 6-10 in. long, linear or ensiform

villous, often purple beneath; upper caudine leaves much shorter; sheaths of radical leaves about 1 in. long, glabrous, those of caudine leaves shortly silky. *Cymes*  $\frac{1}{2}$ -1 in. densely hairy, in the axils of short falcatately decurved ovate acute bracts; bracteoles many, imbricate in 2 series. *Sepals*  $\frac{1}{2}$  in. long, linear-lanceolate, acute, densely villous and ciliate. *Corolla*  $\frac{3}{4}$  in. long, bluish-purple; lobes  $\frac{1}{6}$ - $\frac{1}{5}$  in. ovate, subacute. *Filaments*—spirally twisted, densely bearded with blue hairs. *Style* thickened and with a tuft of hairs at the tip. *Capsule*  $\frac{1}{2}$  in. long, ellipsoid, hairy on its upper half. *Seeds* brown, obscurely rugose.

Agra (Jacquemont). *DISTRIB.* : Chota Nagpur; Bombay Pres. to S. India and Ceylon. A smaller and more glabrous plant than the type; flowers blue. The type occurs in W. India from the Konkan and southwards to Travancore.

**3. *C. axillaris*, Schult. f.** *Syst. vii*, 1154; *Clarke in DC. Mon. iii*, 244; *F. B. I. vi*, 388; *Watt E. D.; Prain Beng. Pl. 1085*; *Cooke Fl. Bomb. ii*, 795. *Tradescantia axillaris*, *Linn.*; *Roxb.*; *Fl. Ind. ii*, 118.

*Roots* fibrous. *Stem* annual, 6-18 in. long, stout or slender, diffusely branched, leafy, glabrous; branches suberect or creeping below or prostrate, glabrous or sparsely hairy, often coloured. *Leaves* sessile, 2-6 in. long, narrowly linear or linear-lanceolate, acute or acuminate, flat, more or less hairy; sheaths  $\frac{1}{2}$  to  $\frac{3}{4}$  in., inflated, ciliate. *Cymes* reduced to axillary fascicles of violet-blue flowers clustered in the inflated sheaths; bracteoles small, almost concealed in the leaf-sheaths. *Sepals*  $\frac{3}{4}$  in. long, lanceolate, acuminate. *Corolla*-lobes broadly ovate, subacute. *Filaments* fusiform below the tip, bearded. *Capsule* about  $\frac{1}{2}$  in. long, oblong-ellipsoid, beaked, glabrous except the beak. *Seeds*  $\frac{1}{6}$  in. long, oblong, compressed, truncate at base rounded at the apex and with a very short conical tip, mottled with dark-brown and shining.

Bundelkhand, in marshy ground (Edgeworth); Agra (Munro); Rohilkhand, Cawnpore and N. Oudh (Duthie), etc. *DISTRIB.* : Throughout India, in the plains, and in Ceylon, extending to Trop. Australia.

**4. *FLOSCOPA*, Lour.**; *Fl. Brit. Ind. vi*, 390.

Erect or subscandent herbs. *Leaves* lanceolate. *Flowers* in terminal or axillary panicles of secund but not scorpioid cymes, bracts minute. *Sepals* 3, oblong, free. *Petals* 3, obovate, free. *Stamens* 6, all perfect or 1 imperfect; filaments filiform,

glabrous. *Ovary* 2-celled, style simple, ovules solitary in each cell. *Fruit* a compressed or didymous loculicidal 2-celled capsule. *Seeds* solitary in each cell, hemispheric.—Species about 12, in the warmer regions of the world.

*F. scandens*, Lour. *Fl. Cochinch.* 193; *Clarke in DC. Mon.* 265; *F. B. I. vi*, 390; *Prain Beng. Pl.* 1086; *Cooke Fl. Bomb.* ii, 796. *Tradescantia paniculata*, Roxb.; *Fl. Ind.* ii, 119. *Aneilema hispidum*. *Don. Prod.* 45.

*Root* fibrous. *Stem* rather slender; erect or subscandent, often creeping and rooting below; internodes long; branches ascending leafy below, glabrous or hairy. *Leaves* sub sessile, 2-4 in. long, elliptic-lanceolate, acuminate, much narrowed at the base, scaberulous above; sheaths loose, short, glabrous or villous, the mouth fringed with long hairs. *Panicles* shortly stalked, pyramidal, with long erect or ascending many-fld. branches. *Flowers* small, pedicelled, subglobose, the lower ones bracteate, the upper without bracts. *Sepals*  $\frac{1}{5}$ - $\frac{1}{8}$  in. long, rotund-ellipsoid, villous. *Petals* longer than sepals, broadly obovate, white lilac or pink. *Filaments* equal, longer than petals, purplish; anthers yellow. *Ovary* glabrous. *Capsule*  $\frac{1}{5}$ - $\frac{1}{8}$  in. in diam., rather broader than long, abruptly acute at both ends, shining. *Seeds* transversely wrinkled on the back.

Dehra Dun, at Nala Pani, and probably elsewhere in marshy ground, within the area of this flora. *DISTRIB.*: Throughout Trop. India and in Ceylon, extending to China and Trop. Australia.

#### CXIV.—JUNCACEÆ.

Erect usually perennial herbs. *Stems* tufted or with a creeping rootstock. *Leaves* flat, terete or reduced to sheaths. *Flowers* small, in axillary cymes, 2-sexual, green or whitish and membranous, or brown and coriaceous, bracts small. *Perianth* inferior, segments or lobes 6, more or less 2-seriate, persistent, imbricate. *Stamens* 6, rarely 3, hypogynous or on the bases of the perianth segments, occasionally those of the inner series obsolete, filaments filiform, anthers basifix. *Ovary* superior, 3 or 1-celled; style simple, with 3 brush-like stigmas; ovules 3, basilar in the 1-celled ovaries or many on the inner angles of the 3-celled ovaries, anatropous. *Fruit* a 1-3-celled capsule, loculicidally 3-valved. *Seeds*

erect ; testa membranous, often produced at each end, albumen dense ; embryo small, near the hilum.—Species about 200, cosmopolitan, but chiefly in damp cold regions.

**JUNCUS.** Linn. ; Fl. Brit. Ind. vi, 392.

Perennial, rarely annual, glabrous herbs. *Stems* simple under the inflorescence. *Leaves* radical or few near the base of the stem, linear or terete or reduced to sheaths. *Flowers* small, usually clustered in fascicles or 2-fid. cymules, either sessile or capitate or unequally peduncled and paniculate, the whole inflorescence terminal or sub-terminal on the scape-like stems, with 1-3 leafy bracts. *Perianth* with 6 free lanceolate or oblong glume-like segments, often with scarious edges, the 3 outer keeled or with a thickened midrib. *Stamens* 6, rarely 3, hypogynous or nearly so, anthers oblong or linear, erect, with longitudinal introrse dehiscence. *Ovary* free, 3 or 1-celled, style filiform ; stigmatic arms 3, often spirally twisted. *Fruit* a capsule, dehiscing by 3 valves with mesial placentas, rarely by 3 valves leaving the placentas persistent or connate in a central column. *Seeds* small, ovoid ; testa striate reticulate or transversely lineate ; embryo small, near the base of the fleshy albumen.—Species about 160, in temp. or arctic regions, rarely tropical.

Annual, leaves not septate ; stems much branched ; cymes scattered, few-flowered ; lateral flowers 6-androus, terminal 3-androus 1. *J. bufonius*.

Perennial, leaves indistinctly and distantly septate ; cymes terminal ; flowers densely clustered in small heads, flowers all 3-androus . . . . . 2. *J. prismatocarpus*.

1. *J. bufonius*, Linn. Sp. Pl. 328 ; Royle Ill. 401 ; F. B. I. 392 ; Collett Fl. Siml. 535 ; Prain Beng. Pl. 1088.

A small pale-green tufted annual, up to 12 in. high. *Stems* erect or ascending, slender, much dichotomously branched from the base. *Leaves* few, chiefly radical, not septate, channelled above. *Cymes* many, scattered on the stem ; bracts scarious. *Flowers* solitary or clustered,  $\frac{1}{2}$ -1 in. long ; the lateral ones open, 6-androus, terminal closed, 3-androus. *Sepals* and *petals* unequal, lanceolate, acuminate, the margins broadly membranous. *Stamens* half as long as the

petals. *Capsule* shorter than and closely embraced by the perianth, obovoid, mucronate. *Seeds* very minute, finely reticulate.

Dehra Dun, Saharanpur, Etawah, and Merwára (Duthie); Agra (Munro); Moradabad (T. Thomson); Bundelkhand (Mrs. Bell). *DISTRIB.*: Plains of N. India and up to 13,000 ft. on the Himalayan ranges; extending to China, S. Africa, Europe (including Britain) to the Arctic regions.

2. *J. prismatocarpus*, R. Brown *Prod.* 259; *F. B. I* vi, 395; *Collett Fl. Siml.* 536; *Prain Beng. Pl.* 1088. *J. indicus*, *Royle ex Don in Trans. Linn. Soc.* xviii, 323.

A perennial cæpítose herb; rootstock very short. *Stem* erect, 18-24 in. long, terete or compressed, sometimes decumbent and rooting at the nodes. *Leaves* few, 2-10 in. long, shorter than the stem, soft, terete or flat or sometimes tubular and indistinctly externally septate. *Cymes* erect, irregularly compound; heads hemispheric, densely 6-10-fld.; lower bract leaflike, erect, shorter than the cyme; floral bracts hyaline, lanceolate-acuminate. *Flowers* green or brown, in small sessile clusters in the axils and at the ends of the unequal branches of an erect terminal panicle. *Sepals* glume-like,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long. *Stamens* 3, much shorter than the perianth. *Style* short, stigmas long. *Capsule* equalling or longer than the perianth, prismatic or conical. *Seeds* minute, reticulate.

N. Oudh, in the Kheri district, Merwára, in tanks (Duthie); also probably in many other localities within the area of this flora, in wet ground. *DISTRIB.*: Common in the plains of Bengal and the Punjab and up to 10,000 ft. on the Himalaya; also on the Bombay Gháts and the Khasia Hills and extending to Ceylon, Burma and Australia.

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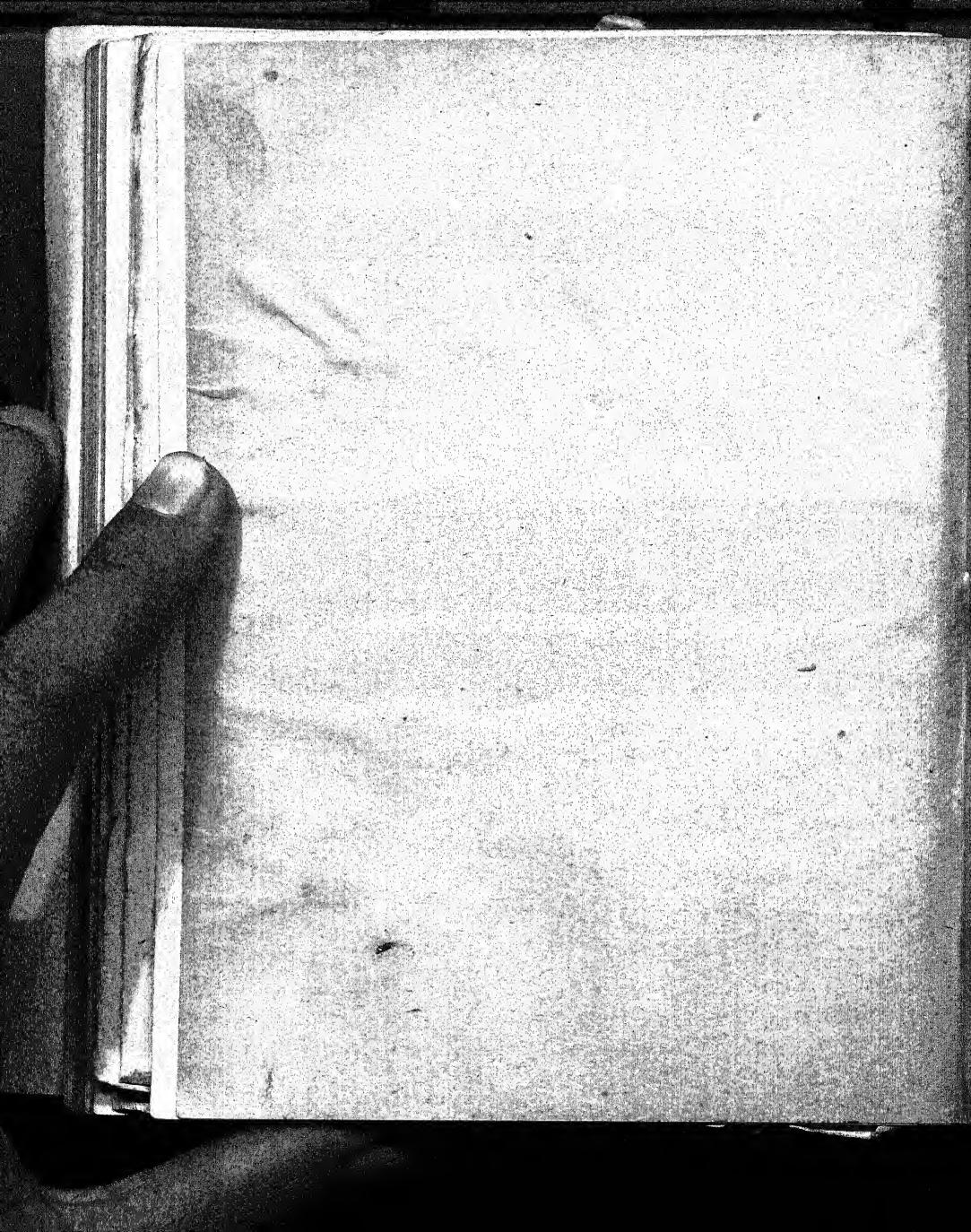
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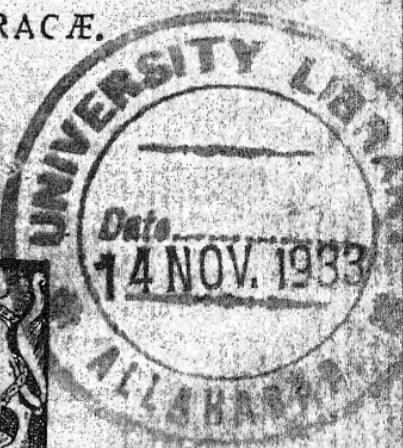
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Vol. III Part III.

FLORA  
OF  
THE UPPER GANGETIC PLAIN,  
AND OF THE  
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.  
PALMÆ TO CYPERACÆ.



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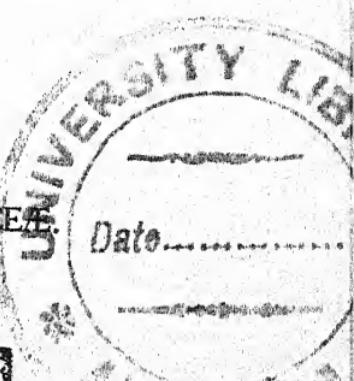
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### Part III.

PALMÆ TO CYPERACEÆ

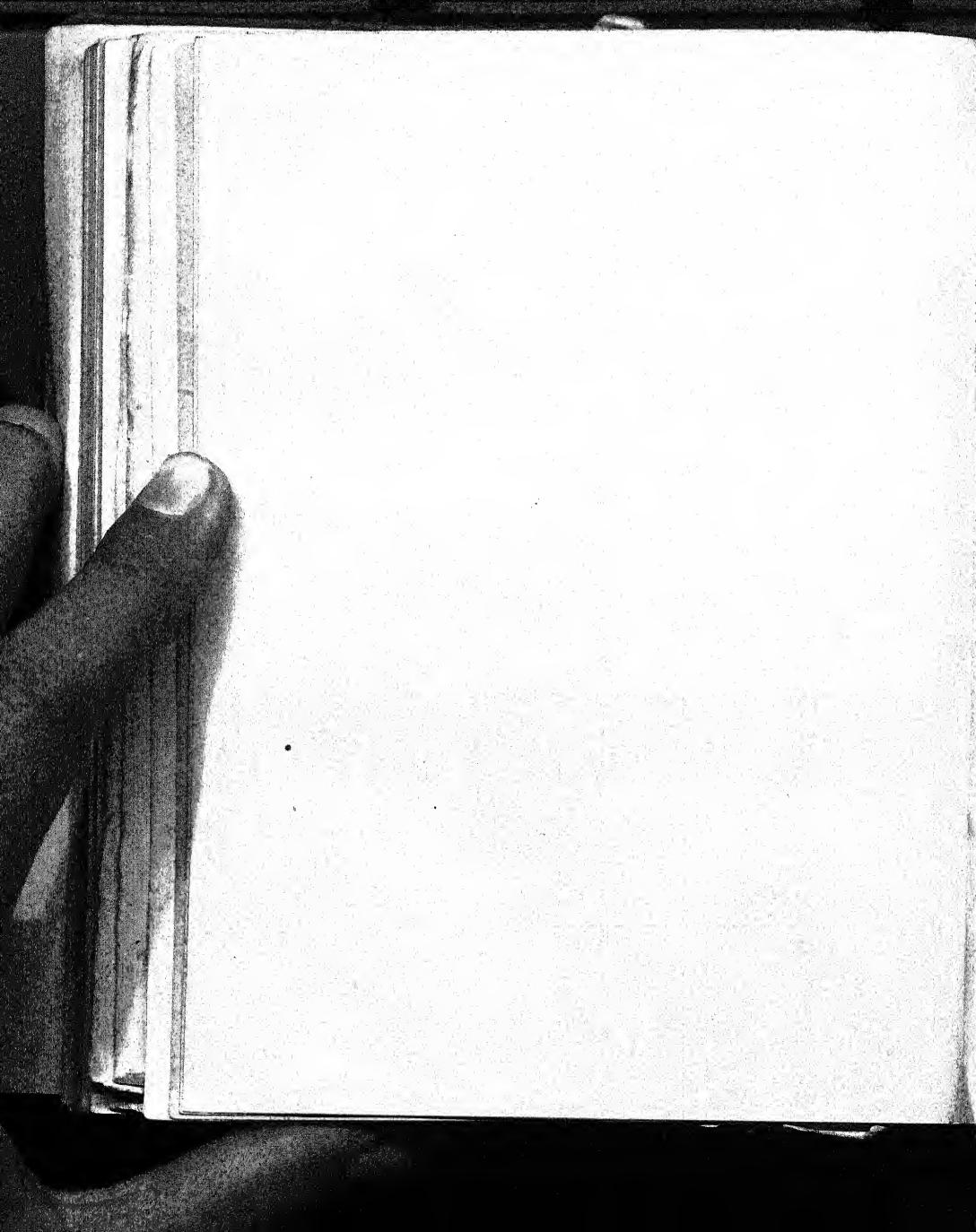


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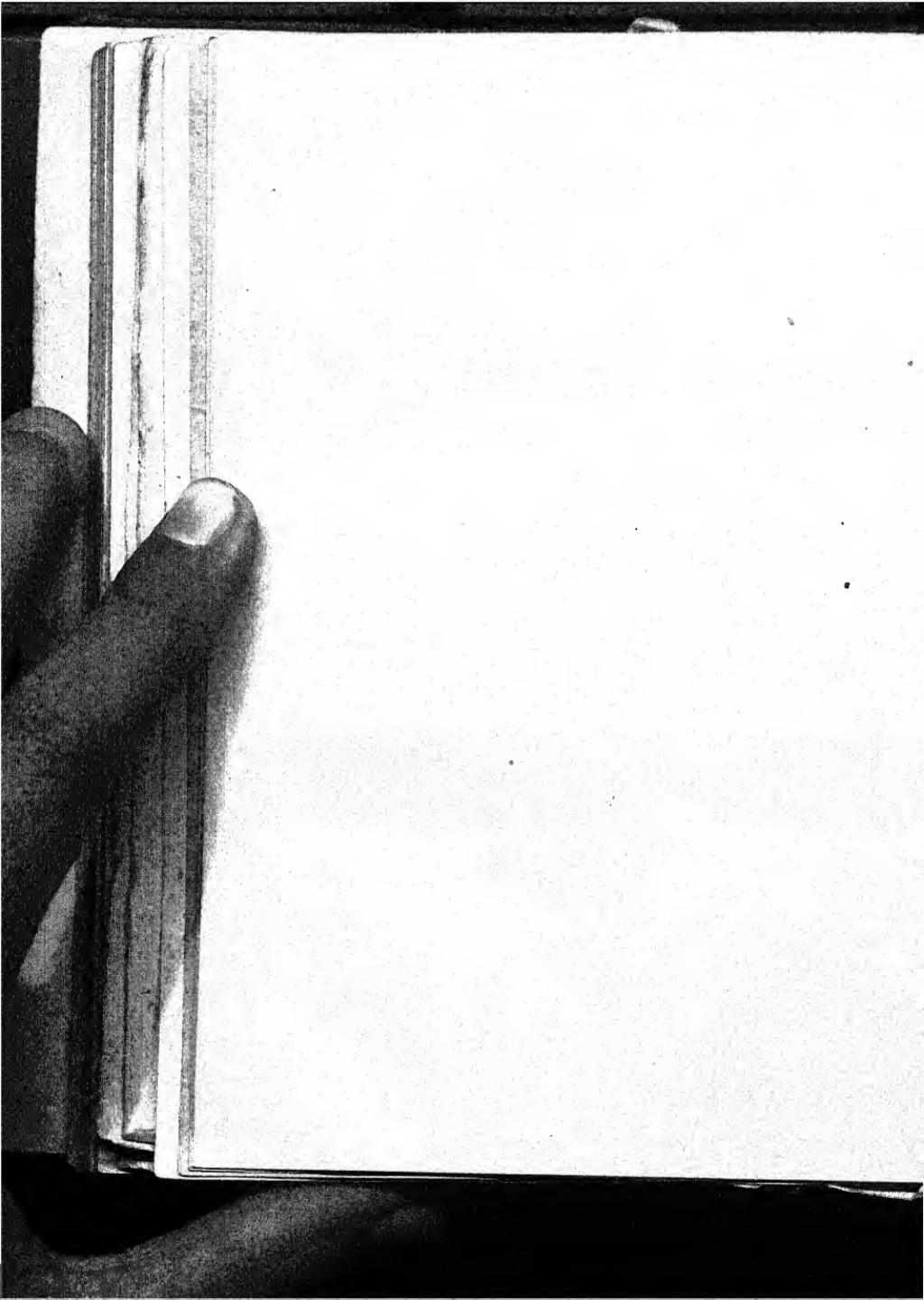
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### Introduction to Vol. III Part III.

The families Palmæ to Aroideæ and Alismaceæ were completed by Mr. J. F. Duthie before his death on 23rd February 1922. The rest of the work has been written at Dehra Dun by Mr. R. N. Parker except for some of the descriptions in Cyperaceæ amounting to about one-third of the species included which are the work of Mr. W. B. Turrill at Kew.



## CXV.—PALMÆ.

Shrubs or trees, solitary or gregarious, naked or prickly, rarely pubescent. *Stem* erect scandent or decumbent, rarely branched above. *Leaves* alternate, plicate in bud, pinnatisect or palmate, rarely entire or 2-pinnatisect, petiole sheathing. *Flowers* small, 1- or 2-sexual, usually 3-bracteolate, in branched spikes or panicles and enclosed in one or more large sheathing spathes. *Perianth* inferior, 2-seriate; segments 3 in each series, usually all free, imbricate or valvate. *Stamens* usually 6, inserted in 2 series opposite the perianth-segments, sometimes 3 opposite the outer series of segments, occasionally many at the base of the perianth, usually included; filaments free or connate, subulate or filiform, rarely flattened; anthers versatile, 2-celled, dehiscence lateral or extrorse. *Ovary* 3-1-celled or of three 1-celled carpels; stigmas 3, usually sessile; ovules 1-2 in each carpel, adnate to the wall or base or top of the cell, anatropous. *Fruit* a 1-3-celled drupe or hard berry, or of 1-3 carpels; pericarp smooth, rough, or clothed with retrorse shining scales. *Seeds* erect or laterally attached, rarely pendulous, raphe usually branching all over the testa; albumen horny or bony, equable or ruminant, embryo small in a cavity near the surface of the albumen.—Species about 1200, widely spread throughout the tropical and sub-tropical regions of both hemispheres.

Trees or erect shrubs, not armed; fruit not clothed with scales . . . . .	1. PHÆNIX.
Scandent prickly shrubs; fruit clothed with reflexed shining closely adpressed imbricating scales . . . . .	2. CALAMUS.

## 1. PHÆNIX, Linn.; Fl. Brit. Ind. vi, 424.

Tall or short simple or suboliferous palms. *Leaves* pinnatisect; segments lanceolate or ensiform with induplicate margins. *Flowers* small, dicecious, yellowish, coriaceous, on usually several branched

interfoliar erect or drooping spadices; spathe basilar, complete, coriaceous. MALE flowers: *Sepals* 3, connate in a cupular 3-toothed calyx. *Petals* 3, obliquely ovate, valvate. *Stamens* 6; filaments short, subulate; anthers erect, dorsifixed. *Pistillode* minute or none. FEM. flowers: *Sepals* 3, connate in a globose accrescent calyx. *Petals* 3, rounded, imbricate. *Staminodes* 6, free or connate in a 6-toothed cup. *Carpels* 3, free; stigmas sessile, uncinate; ovules erect. *Fruit* oblong terete, 1-seeded, with a terminal stigma; pericarp fleshy; endocarp membranous. *Seed* oblong, ventrally grooved; albumen equable or subruminate; embryo dorsal or subbasilar.—Species about 11, in trop. and subtropical Asia and Africa.

A tall palm with a slender stem up to 50 ft. high . . . . .

1. *P. sylvestris*.

Dwarf palms with short or moderately long stems:—

Stems very short and usually more or less bulbiform; fruiting peduncle very short; fruit red becoming black when ripe . . . . .

2. *P. acaulis*.

Stems at length more or less elongate; fruiting peduncle usually long; fruit red . . . . .

3. *P. humilis*.

1. *P. sylvestris*, Roxb.; *Fl. Ind.* iii, 787; *Brandis For. Fl.* 554; *Ind. Trees* 645; *F. B. I.* vi, 425; *Watt E. D. vol. VI*, Pt. 1-A, 200; *Kanji Lal For. Fl.* (ed. 2) 345; *Gamble Man.* 731; *Prain Beng.* Pl. 1098; *Cooke Fl. Bomb.* ii, 801.—Vern. *Khajur* (Hind.)—Wild Date-palm.

A tall graceful palm 30-50 ft. high, with a large thick hemispherical crown. Trunk solitary, clothed with the persistent bases of the petioles. Leaves pinnate, greyish-green, 7-12 ft. long, glabrous; leaflets 1-2 ft. by  $\frac{1}{4}$ -1 in. fascicled, 2-4-farious, rigid; petioles short compressed towards the apex, bearing at the base a few channelled triangular spines up to 4 in. long. MALE flowers white, scented. *Spadix* 2-3 ft. long, erect; branches filiform; peduncles much compressed. *Spathes* 12-16 in. long, scurfy, separating into 2 boat-shaped valves. FEM. flowers: spadix and spathe as in male; fruiting peduncles about 6 in. long; fruiting spadix 3 ft. long, nodding, much compressed, of a golden-orange colour. *Fruit* oblong-ellipsoid, orange-yellow to reddish-brown, edible. *Seeds*  $\frac{1}{2}$  in. long, rounded at ends, grooved to the centre on one face, pale-brown.

Cultivated and wild in many parts of India and in Burma. It is undoubtedly indigenous in the Indus basin (Aitchison) and probably so in the Bombay Presidency, where it is commonly found growing gregariously on moist soil in the drier districts. It is abundant in Bundelkhand, especially near Jhansi and Lalitpur, and in the Sub-Himalayan tracts of Pilibhit and of Northern Oudh. The tree is much tapped both in Bengal and Madras, and the liquid obtained thereby is either drunk fresh or after fermentation, or it is boiled down into sugar. The constant tapping of these trees very much spoils their graceful appearance, and also injures the quality of the fruit. The tree flowers in December and January, and the fruit ripens April-June. The wood is used in the building of native huts, or for water-pipes, and from the leaves matting, ropes and baskets are made. See also page 64 in Vol. iii of this work under *Loranthus longiflorus*.

**2. *P. acaulis*, Roxb. Hort. Beng.; 73; Buch.-Ham. ex Roxb. Fl. Ind. iii, 783; Brand. For. Fl. 555; Ind. Trees 645; F. B. I. vi, 426; Watt E. D. vol. VI, Pt. 1-A., 199; Comm. Prod. Ind.; Gamble Man. 730; Prain Beng. Pl. 1096; Cooke Fl. Bomb. ii, 802; Kanji Lal For. Fl. (ed. 2) 411.—Vern. Khajur, Khajuri (Hind).—Dwarf-Date Palm.**

*Stem* very short, more or less bulb-like, 6-10 in. in diam., clothed with the sheaths and bases of the petioles. *Leaves* 2-6 ft. long; leaflets 10-20 by  $\frac{1}{2}$ - $\frac{2}{3}$  in., stiff, fascicled; the base thickened and decurrent; petioles 1 ft. or more long, with spines 2-6 in. long. *Spadix* 6-10 in. long, compressed, rather longer than the spathe; branches very stout, yellow. *Spathes* about 6 in. long, with their bases rather below the surface of the ground. *MALE* flowers  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, alternate, solitary, pale-yellow. *FEM.* flowers: *Spadix* and *spathe* as in the male. *Calyx* cup-shaped, truncate, with 3 obscure 'teeth' on the margin. *Petals* thick, fleshy. Fruiting peduncle short, usually concealed among the leaves. *Fruit*  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, oblong-ellipsoid, black when ripe, edible. *Seed*  $\frac{1}{2}$  in. long, deeply grooved.

Common in the Dehra Dun and Saharanpur forests, and generally in open grassy spaces, extending eastwards along the Sub-Himalayan tracts of Pilibhit and N. Oudh up to 2,500 ft. and accompanying Sál and the long-leaved pine. (*Pinus longifolia*). It flowers during Dec. and Jan., and the fruit ripens during April and May. *DISTRIB.* Outer Himalayan ranges from Garhwal and Kumaon eastwards to the Khasia Hills and Upper Burma. It is found also in Behar and in the hilly parts of C. India, and in the district of N. Kanara in the

Bombay Presidency. The leaves are made into matting, and the fruit is eaten; also a kind of sago is sometimes obtained from the pith.

3. *P. humilis*, Royle Ill. 394, 397, 399; F. B. I. vi, 426; Brandis For. Fl. 555; Ind. Trees 645; Gamble Man. 731; Kanjilál For. Fl. (ed. 2) 412.—Vern. *Khajur*; *Chota Khajur* (Bijnor); *Thákil* (Kumaon).

Stem slender, sometimes short or up to 10 or 12 ft. high. Leaves 3-8 ft. long; rhachis laterally compressed; leaflets 12-18 in. long, thin, smooth, faintly nerved, always folded, generally scattered, sometimes in opposite pairs; base only slightly raised on the side of the rhachis or not at all. Male spadix 1 ft. long; female a little shorter (excluding peduncle); spikes often paniculately subdivided; peduncles flat, of the fruiting spadix 2-2½ ft. long and  $\frac{1}{2}$ - $\frac{3}{4}$  in. broad. Fruit almost horizontal,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovoid, usually mucronate, red when ripe.

Abundant on the Siwalik range within the Saharanpur district, especially near the crest, and in the vicinity of the Rámpur bungalow, where the stems of some of the trees rise to 10 or 12 ft. high. It is also mentioned by Stewart as occurring in the forests of the Bijnor district. The trees are in flower during Dec. and Jan., and the fruit ripens April-June. DISTRI.: Common in the *chir* forests of the outer Himalayan ranges of Garhwal and Kumaon, up to 5,000 ft., and eastwards to Assam and the Khasia Hills. It is said also to occur in Cent. India. Economic uses as of *P. acaulis*.

## 2. CALAMUS, Linn.; Fl. Brit. Ind. vi, 436.

Armed, erect or scandent, tufted palms. Leaves alternate pinnatisect; segments acuminate, nerves parallel, rhachis often produced as an armed flagellum; sheath armed, produced into a ligule or ochrea, with or without a lateral armed flagellum. Flowers polygamodioecious, in usually distichous often scorpioid spikelets, solitary (either male or fem. or both) in the axils of the bracteoles of axillary usually much-elongated and much-branched spadices which are sometimes produced as a flagellum; spathes tubular or open, persistent, sheathing the peduncle and branches of the spadix and passing into bracts and bracteoles. MALE flowers: Calyx cupular, 3-toothed. Petals 3, acute, coriaceous, valvate. Stamens 6, filaments short, anthers dorsifixed. FEM.

flowers: slightly accrescent, fruiting pedicelliform or explanate. *Calyx* tubular, 3-toothed. *Corolla* tubular, 3-fid., lobes valvate. *Staminodes* forming a cup. *Ovary* incompletely 3-celled, clothed with retrorse scales, style short or long, stigmas 3; ovules basilar, erect. *Fruit* globose or ellipsoid, style terminal; pericarp thin, clothed with adpressed deflexed closely imbricate shining scales. *Seed* subglobose or oblong, smooth or pitted; albumen equable or ruminata, embryo ventral or basal.—Species about 165; in India and Malaya to S. China and N. Australia, a few also in Trop. Africa.

*C. tenuis*, Roxb.; *Fl. Ind.* iii, 780; *Brandis For. Fl.* 559 (in part); *Ind. Trees* 652; *F. B. I.* vi, 447; *Watt E. D. vol. II, Pt. 1,23*; *Gamb. Man.* 735; *Kanjilal* (ed. 2) 412; *Prain Beng. Pl.* 1099; *Beccari in Rec. Bot. Surv. Ind.* ii, 206; *Ann. R. Bot. Gard. Calc.* xi, part 1, 262, t. 94.—Vern. *Bet, bent.*

*Stems* very long, scandent; internodes not thicker than a goose-quill. *Leaves* 1½-2 ft. long; leaflets very many, equidistant; lower ones 8-12 in. long by  $\frac{1}{2}$ - $\frac{1}{4}$  in. wide; margins minutely setulose or spinulose; uppermost leaflets gradually smaller, linear-lanceolate, acuminate, the 3 costæ all setose above, the median one only below; petiole short, stout, margined with straight spines, and rhachis armed with one row of short recurved spines; sheaths flagelliferous, sparingly armed with short flat spines. *Spadix* very long, decompound, flagelliferous. *Spathes* elongate, tubular, the lower ones with a short limb and scattered recurved spines. *Lower spikes* paniced, 1½-4 in. long. *Flowers* very small; the males  $\frac{1}{10}$  in. long, secund in 3-4 series, imbricating, suberec. *Fruit* subglobose,  $\frac{1}{2}$  in. in diam., mucronate; scales pale, with a shallow median channel and very narrow discoloured margins.

Plentiful in Dehra Dun in swampy ground; also in the Sub-Himalayan tracts eastwards to Gorakhpur. Flowers during July and Aug., and the fruit ripens in the cold season. DISTRIB.: Trop. Himalaya from Garhwāl and Kumaon eastwards to Assam, Chittagong, Burma and Cochin. This is the common *rattan* of N. India, largely used for mats screens and baskets. The leaves are largely eaten by buffaloes, and the scaly fruits are often made into rosaries.

The two following palms require some special mention here for the reasons given under each:—1. *WALLICHIA DENSIFLORA*, Mart.; *F. B. I.* vi, 419; *Kurz For. Fl.* ii, 532; *Watt E. D.*; *Brand. For.*

*Fl. 549*; *Ind. Trees 655*; *Gamble Man. 728*; *Prain Beng. Pl. 1094*; *Bot. Mag. 4584*; *W. oblongifolia*, *Griff. Vern. Kála aunsa*.

The genus *Wallichia* of Roxburgh consists of 3 species, one of which (*W. densiflora*) was found many years ago by the late Sir D. Brandis in the subtrop. forests of the Gonda district, N. Oudh—a locality which is strictly within the area of this flora. It occurs also on the borders of Nepal where it was collected by myself. It was met with also by T. Thomson, and by Strachey and Winterbotham in Kumaon in similar forests up to 6,000 ft., and it extends eastwards to Assam and Chittagong. (See Prain in Beng. Pl. 1094.) The following description of *Wallichia densiflora*, Mart. has been taken from the *Fl. Br. Ind. vi*, 419.—*Stems* very short or none, or occasionally up to 15 ft. (fide Kurz l.c.); trunk sheathed; sheaths villous, resolving into strong fibres. *Leaves* 8-10 ft. long; leaflets 1-2 ft., alternate; the lower ones 2-4-nate, 1-costate and with many parallel bright green nerves; sheaths, scurfy. *Spathes* purple. *Spadices* 12-18 in. long; branches of the female ones very stout, flowers in many spiral series; male flowers yellow, solitary, or the lower in pairs with an intermediate female. *Filaments* adnate to the petals. *Female flowers* purplish. *Calyx* very short; *corolla* lobes obtuse. *Fruit* about  $\frac{1}{2}$  in. long, dull purple.

2. *Nannorhops Ritchieana*, *W. Wendl.*; *Brandis Ind. Trees, 719*; *F. B. I. vi*, 429; *Aitch. in Journ. Linn. Soc. xix*, t. 26. *Chamaerops Ritchieana*, *Griff. in Calc. Journ. Nat. Hist. v. 342*; *Palms Brit. Ind. 135*; *Brand. For. Fl. 547*; *Gamble Man. 733*; *Gard. Chron. (1886) 652*, fig. 128, 129.—*Vern. Patha*.—A gregarious tufted low growing glabrous palm with prostrate branching robust rhizomes or stems. *Leaves* cuneately flabellate, rigid, plicate, split into curved 2-fid. segments; petiole short. *Spadix* interfoliar, much-branched. *Spathes* tubular, sheathing. *Flowers* polygamous. *Calyx* tubular membranous, unequally 3-lobed. *Corolla* 3-partite, segments valvate. *Stamens* in hermaphrodite flowers 6, in the males about 9. *Ovary* trigonous; style basilar. *Seed* free, erect, ventrally hollowed. This tree is found wild in Sindh and in the W. Punjab including the Salt Range. It is abundant also in Baluchistan and Afghanistán, and is much used by the Pathán people for making into mats and fans, also into

sandals and baskets ; the leaf-buds and young inflorescence are much eaten, as also the fruit. The seeds are pierced and exported in large quantities by the Frontier tribes to Mecca to be used as rosaries. In its wild condition this palm receives very little protection against the severe injuries dealt to the trees owing to the great demand by the inhabitants of those countries of so many different kinds of products of this palm. Its cultivation in the Govt. Garden at Saharanpur and elsewhere in N. India offers very good examples of the benefits of protection. In fact the specimens as grown at Saharanpur are much taller and more luxuriant than the wild kind found in Baluchistan.

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### CXV-A.—PANDANEÆ.

Trees or shrubs, sometimes scandent, with stilted or climbing aerial roots. *Leaves* usually 3-farious, narrow, acuminate, coriaceous, with margins and keels usually spinously toothed. *Flowers* diœcious, small, crowded on catkin-like, simple or branched axillary spadices clothed with leaf-like spathes ; perianth none ; bracts and bracteoles none. *MALE flowers* : Stamens many ; filaments free or connate ; anthers erect, basifixied. Pistillode small or obsolete. *FEM. flowers*. *Staminodes* small or none. *Carpels* solitary, free or connate in phalanges of 2 or more ; ovules solitary and suberect or many and parietal ; stigmas subsessile, papillose. *Fruit* a globose or oblong mass of free or connate, 1- or more-celled, woody or fleshy angular drupes. *Seeds* minute ; testa striate ; albumen hard ; embryo minute.—Species about 80, in Tropical Asia and Africa, growing mostly near the sea-coast in a wild state.

#### PANDANUS, Linn. f. ; Fl. Brit. Ind. vi, 483.

Characters those of the family.

*P. fascicularis*, Lamk. ; *F. B. I. vi*, 485 ; *Prain Beng. Pl. 1101.*

*P. odoratissimus*, Roxb. *Fl. Ind. iii*, 733 ; *Gamble Man. 740.*  
*Watt E. D. vol. 6, Pt. 1-A. 4*—*Vern. Keora.* (Screw Pine).

A much-branched bush or a small tree, 10-12 ft. high. Often planted in village thickets within the area of this flora, and especially near

temples. The very fragrant flowers are much appreciated by the natives. The soft floral leaves are eaten as a vegetable, and the pulp of the fruit is often eaten.

### CXVI.—TYPHACEÆ.

Aquatic or palustrine perennial herbs. *Leaves* linear, erect or floating, sheathing below, nerves parallel. *Flowers* monoecious or dioecious, small, crowded in globose or cylindric bracteate spikes of which the upper are males; bracteoles none. *Perianth* of membranous green scales or fine hairs. *MALE flowers*: *Stamens* 1-7; filaments free or connate; anthers basi-fixed, erect, cuneate or linear-oblong, dehiscing longitudinally; connective sometimes produced. *Pistillode* none. *FEM. flowers*: *Ovary* superior, 1- or 2-celled; styles free, persistent; stigmas laterally papillose; ovules 1 in each cell, pendulous from apex of cell. *Fruit* membranous or drupaceous. *Seeds* pendulous; albumen fleshy or floury; embryo axile, cylindric, the radical end thickened, plumule in a lateral slit.—Species about 15, cosmopolitan.

Perianth of slender hairs . . . . . 1. TYPHA.

Perianth of green scales . . . . . 2. SPARGANIUM.

#### 1. TYPHA, Linn.; Fl. Brit. Ind. vi, 488.

Marsh herbs. *Leaves* erect spongy. *Flowers* small, in very dense superposed cylindric spikes, often intermixed with hairs dilated at tip. *Perianth* of capillary hairs, or obsolete in the male. *Stamens* 1 or more, connective thickened at the tip. *Ovary* often reduced to a clavate-tipped hair, long-stalked, narrowed into a capillary style with a clavate or filiform stigma. *Fruit* very minute; pericarp membranous, indehiscent or follicular. *Seed* with striate testa, albumen floury.—Species about 10, in temp. and tropical regions.

Leaves 3-gonous above the sheath; pollen  
4-globate . . . . .

1. *T. elephantina*.

Leaves semi-cylindric above the sheath; pollen  
simple . . . . .

2. *T. angustata*.

1. *T. elephantina*, Roxb.; *Fl. Ind.* iii, 566; *F. B. I.* vi, 489; Watt, *E. D.* see vol. 6. pt. 4. p. 207; *Prain Beng. Pl.* 1102; Cooke *Fl. Bomb.* ii, 816; *Kanjilál For. Fl.* (ed. 2), 413. *T. latifolia*, *Edgew.* in *Proc. Linn. Soc.* vi (1862), 194.—Vern. *Pater*.—Elephant grass.

A tall bulrush, 8-12 ft. high. *Leaves* 1-1½ in. broad 3-gonous above the sheath; margins often undulate above the middle. *Male spike* 10-12 in. long; rhachis clothed with short often forked hairs. *Flowers* bracteolate; bracts 3 or more. Anthers 1-5,  $\frac{1}{5}$  in. long; pollen 4-globate. *Fem. spike* much stouter than that of the male, 6-10 in. long by  $\frac{1}{2}$ -1 in. diam.; the flowers mixed with clavate pistillodes; bracteoles with fasciate tips, much longer than the hairs which are shorter than the lanceolate stigmas.

Dehra Dun, and Patri forest in swamps (Kanjilál); Moradabad (T. T.); Bijnor (Stewart); Merwára (Lowrie). *DISTRIB.*: Marshes in N. W. India and eastwards to Assam, Bengal and Burma, extending beyond India to N. Africa. The leaves are often used within the area of this flora for making mats and screens.

2. *T. angustata*, Chab. & Bory.; *F. B. I.* vi, 489; Watt *E. D.* vol. VI, Pt. 4, 207; *Prain Beng. Pl.* 1102; Cooke *Flor. Bomb.* ii, 815. *T. angustifolia*, Sibth. and Sm. (not of Linn.). Roxb. *Fl. Ind.* iii, 567.—Vern. *Pater*.

A tall bulrush. *Stems* 5-10 ft. high. *Leaves* usually exceeding the flowering stems,  $\frac{3}{4}$ -1 in. broad, semi-cylindric above the sheath. *Spikes* cylindric, the male and female spikes often separated by a long interval. (See Aitchison in *Trans. Linn. Soc. (N. S.)* iii, 20 regarding the sometimes dioecious condition of this species). *Fem. spikes* pale-brown,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam.; the male flowers mixed with clavate-tipped pistillodes; bracteoles subspathulate, equalling the linear stigmas, both longer than the hairs. *Pollen* simple.

More or less distributed through Northern India from Kashmir to Manipur and southwards to Sind and the Bombay Pres. and also in Bengal and Coromandel. According to Roxburgh this species is found in similar ground as the former, and flowers at the same time, but it is a smaller plant and much less plentiful. It closely resembles the common European *T. angustifolia* Linn., but differs by the bracteoles equalling the stigmas. In Sind the pollen is said to be collected from the flowers and made into cakes and eaten by all classes of natives.

## 2. SPARGANIUM, Linn.; Fl. Brit. Ind. vi, 489.

Flowers in globose unisexual heads, subtended by leafy bracts. *Perianth* of 3-6 membranous scales. *Stamens* 2-3, connective hardly produced at the tip. *Ovary* 1- rarely 2-celled; style very short, persistent; stigma unilateral; cells 1-seeded. *Drupes* obovoid, spongy; endocarp tip perforated. *Seed* adherent to the endocarp.—Species about 6.

*S. ramosum*, Huds. Fl. Angl. 401; F. B. I. vi, 490. *S. carinatum*, Buch.-Ham. ex Royle Ill. 408.—Bur-weed.

*Stems* erect, 1-4 ft. high. *Leaves* linear, triquetrous at the base, 2-5 ft. long, 1 in. broad or less. *Heads* sessile on the branches of a panicle; male heads olive-brown  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., deciduous; fem. heads 1 in. in diam., in fruit; scales linear, tips spatulate. *Drupes* sessile, shortly beaked,  $\frac{1}{2}$  in. long, angled; stigma linear.

N. Oudh, in the Bahraich district (Duthie). DISTRIB.: Punjab (T. Thomson), and in Kashmir up to 5, 200 ft. also in Afghanistan (Griff.) and in Tibet (Watton); also in Burma and in N. Temp. regions.

## CXVII.—ARCIDEÆ.

Herbs with watery acrid or milky juice, usually glabrous, rarely armed, stemless or with a short stock or corn or tuber; or shrubs with sympodial branches climbing by aerial roots. *Leaves* of shrubby species alternate, distichous or spiral; of herbaceous species few, clustered or solitary, radical, sometimes appearing without or after the flowers; petiole with a sheathing base; lamina entire or lobed or pinnate or perforate, often with cataphyllaries at the base of the leaf-sheaths. *Flowers* 1- or 2-sexual, sessile on a spadix which is more or less completely enclosed in a green or coloured spathe; when 1-sexual usually monocious with the males towards the apex of the spadix, often with neuters between them as well as above the males. *Perianth* none or of scales, rarely cupular or urceolate. *Stamens* in the 2-sexual flowers 4-8, in the males 1 or more, distinct or confluent; anthers 2-4-celled, free or (in confluent stamens) connate by means of the

thickened connective; the cells discrete or contiguous, free or buried in the connective and opening usually by a terminal pore; rarely by a longitudinal slit; pollen globose or ellipsoid, powdery or conglomerate. *Ovary* sessile, 1-3-celled, style short or long, inserted. *Fruit* of many small free or connate berries or drupes adnate to the spadix. *Seeds* in each drupe or berry 1 or few, usually embedded in pulp; albumen copious scanty or none, embryo axile, or in exaluminous genera thick and with the plumule in a lateral slit.—Species about 1,000, mostly in tropical regions of both hemispheres.

Flowers 1-sexual, monococious, rarely (*Arisaema* often) dioecious:—

Water or marsh plants; leaves entire; barren appendage none; ovules orthotropous:—

Floating, stemless, aquatic herbs; leaves sessile, obovate-cuneate, in a rosette-like tuft; base stoloniferous . . . . .

1. PISTIA.

Submerged or marsh plants; leaves tufted from a buried creeping root-stock . . . . .

2. CRYPTOCORYNE.

Terrestrial herbs:—

Leaves and scapes rising directly from a tuber-like hypogeal corm, the leaves usually more or less lobed.

Spadix with a barren terminal appendage:—

Male flowers stipitate; flowers often dioecious; leaves variously lobed; ovules orthotropous . . . . .

3. ARISEMA.

Male flowers sessile or nearly so; flowers always monococious:—

Flowers preceding the solitary leaf; males and females remote; neutrals present above the females; leaves pedatipartite; edges of spathe connate below; ovules orthotropous . . . . .

4. SAUROMATUM.

Males and females contiguous or nearly so; neuters wanting; leaves 3-sect.; segments pinnatifid; edges of spathe free; ovules anatropous . . . . .

5. AMORPHOPHALLUS.

Spadix without a barren terminal appendage; males and females separated by a belt of fusiform pearly-white neuters; flowers appearing without the leaves; leaves 3-sect.; segments pinnatifid; ovules anatropous . . . . .

6. PLESMONIUM.

Leaves and scapes rising from a short caudex prolonging a hypogaeal rhizome; connective wider than the anther cells; flowers and leaves present together. Leaves peltate;

7. COLOCASIA.

Spadix with a barren appendage, not adnate at its base to the spathe; ovules many, parietal . . . . .

8. REMUSATIA.

Spadix without an appendage; ovules many, parietal; spadix quite free from spathe . . . . .

9. SCINDAPSUS.

Flowers hermaphrodite, rarely a few 1-sexual; spadix without an appendage; perianth wanting; epiphytic climbing herbs; ovules solitary, basal; berries free . . . . .

1. PISTIA, Linn.; Fl. Brit. Ind. vi, 496.

A floating gregarious stemless stoloniferous herb. Leaves sessile, obovate-cuneate, together forming an erect cup. Spathe small, shortly stalked, tubular below, open above. Spadix adnate to the back of the tube of the spathe, free above. MALE inflor. of a few sessile connate stamens beneath the apex of the spadix; cells opening by vertical slits, with a ring of minute confluent neuters below them. FEM. inflor. a solitary ovoid-conic 1-celled ovary, style conical, stigma discoid; ovules many, basal or sub-parietal, orthotropous. Fruit membranous, few-seeded. Seeds oblong or obovoid, testa at length rugose; albumen copious,

floury, embryo minute, apical, cuneiform.—A single species, distributed widely in most tropical and subtrop. countries. *Pistia* is a link to Lemnaceæ from Aroideæ.

**P. Stratiotes**, *Linn. Sp. Pl. 963*; *Roxb. Fl. Ind. iii, 131*; *F. B. I. vi, 497*; *Watt E. D. Prain Beng. Pl. 1105*; *Cooke Fl. Bomb. ii, 817*.—*Vern. Jal-Khumbi* (Hind).

*Roots* of tufted simple white fibres clothed with fibrillæ. *Leaves* obovate-cuneate, rounded or retuse at the apex, variable in breadth  $1\frac{1}{2}$ -4 in. long, densely pubescent on both surfaces; nerves flabellate, converging within the margin. *Spathe* about  $\frac{1}{2}$  in. long, obliquely campanulate, white gibbous and closed below, contracted about the middle, dilated and suborbicular above.

Abundant within the area of this flora, floating on the surface of fresh water-pools and tanks. *DISTRIB.*: Throughout India and in Ceylon; extending to most tropical and sub-tropical countries. It flowers in India in the hot season, and the seeds ripen during the rains.

## 2. CRYPTOCORYNE, Fisch.; *Fl. Brit. Ind. vi, 492.*

Aquatic or marsh herbs; stem short or none or with a creeping rootstock. *Leaves* broad or narrow. *Spathe* tubular, the margins connate and with a transverse septum within below. *Spadix* very slender, its tip adnate to the septum of spathe. *MALE inflor.* cylindric. *Stamens* 1 or 2, distinct; anthers short, sessile, truncate; cells 2, with conical perforate tips, pollen vermiform. *FEM. inflor.* a single whorl of connate 1-celled many-ovuled ovaries with a few neuters; styles short, recurved; ovules erect, orthotropous. *Fruit* a fleshy syncarpium of connate coriaceous 2-valved many-seeded carpels, the valves stellately spreading. *Seeds* oblong, testa rugose; albumen copious; embryo axile; plumule sometimes germinating in the fruit.—Species 26, in Trop. Asia.

**C. retrospiralis**, *Kunth, Enum. iii, 12*; *F. B. I. vi, 493*; *Prain Beng. Pl. 1106*; *Cooke Fl. Bomb. ii, 818*. *Ambrosinia retrospiralis*, *Roxb. Fl. Ind. iii, 492.*

An aquatic herb, usually submerged. *Root* of fleshy fibres. *Stem* short or none. *Leaves* many, radical, 3-18 in. long, sessile, or with a short stout petiole narrowly linear or linear-lanceolate, acute or finely acuminate; midrib slender. *Spathe* subsessile, about as long

as the leaves, deep green striped with purple; tube narrow, longer than the limb, not or scarcely twisted; limb glabrous closely twisted. Ovaries 5-6, 3 or more ovuled; stigmas orbicular.

Agra (Munro), and probably plentiful within the area of this flora.  
DISTRIB.: Bengal, Behar and mostly throughout India extending to Burma.

3. **ARISÆMA**, Mart.; Fl. Brit. Ind. vi, 497.

Tuberous herbs, with leaves and flowers usually contemporaneous. Leaves 1-3, trisect or pedate or verticillately 5- or more-sect. Flowers 1-sexual, usually diœcious. *Spathe* deciduous; tube convolute; limb acuminate or caudate, usually incurved. *Spadix* included or exserted, always with a barren appendage, usually long and filiform. **MALE** flowers many, stipitate; anthers 2-5; cells distinct or confluent. **FEM.** flowers densely crowded. *Ovary* 1-celled; ovules 2 or more, basilar, orthotropous; style short or none; stigma discoid. **NEUTER** flowers none, or few and subulate. *Fruit* a 1- or few-seeded berry. *Seeds* ovoid or globose; testa rather thick; albumen copious; embryo axile.—Species about 50 in Temp. and Trop. Asia and in N. Amer.

*A. tortuosum*, Schott.; F. B. I. vi, 520; Watt E. D.; *Prain Beng. Pl.* 1106; Collett Fl. Siml. 540. *Arum curvatum*, Roxb. Fl. Ind. iii, 506; Wight Ic. 788.

The specimens collected by Mr. P. W. Mackinnon in Dehra Dun at about 3,000 ft. differ very considerably from the typical *A. tortuosum* of Schott, which is found abundantly on the Simla Hills at a much higher-elevation. The tubers of the Dehra Dun plant are usually much smaller, and the leaflets are very different, and much more like those of *A. hellborifolium* as depicted on p. 541 of Collett's *Flora Simlensis*.

4. **SAUROMATUM**, Schott; Fl. Brit. Ind. vi, 508.

Tuberous herbs. Leaf solitary, pedatipartite, long-petioled. Flowers monœcious, preceding the leaves. *Spathe* shortly peduncled; tube cylindric, short, margins connate below; limb very long, narrow, open, reflexed. *Spadix* sessile, very long, with

a slender barren appendage as long as the spathe. *Male* and *fem.* inflorescences short and widely distant, dense-flowered and with a few large clavate neuters close above the *fem.* flowers. *MALE* flowers: *Anthers* sessile, subcompressed, 4-lobed, contiguous opposite, obovate-oblong, opening by terminal pores; connective prominent. *FEM.* flowers: *Ovary* oblong, 1-celled, rounded at the apex; ovules 1-2, erect, basal; style very short or none. *Fruit* of obpyramidal 1-seeded subtipitate berries. *Seed* globose, with an obconic strophiole; albumen copious; embryo axile.—Species about 8, in trop. and subtrop. Asia and in Trop. Africa.

*S. guttatum*, Schott; *F. B. I.* vi, 508; *Watt E. D.*; *Collett Fl. Siml.* 542; *Prain Beng. Pl.* 1109; *Cooke Fl. Bomb.* ii, 824. *Arum sessiliflorum*, Roxb. *Fl. Ind.* iii, 507.—*Vern. Dhey* Rohilkhand, *Nim-Kerowly* (Fatehghar).

*Tuber* large. *Leaf* 6-12 in broad; segments 7-15, variable, 2-15 in. long by 1-3 in. broad, elliptic; acuminate, deep-green; midrib and veins impressed above, prominent beneath; petiole stout often spotted. *Peduncle* short stout. *Spatha* 12-28 in.; tube ovoid or sub-globose; limb linear-lanceolate, thick, green or yellowish, usually with dark purple spots; margins usually purple and undulate. *Spadix* about as long as the *spatha*, with an appendage 2-8 in. long. *Male inflor.*  $\frac{1}{2}$  in. long, about 3 in. above the *fem. inflor.* *Anthers* densely packed. *Fem. inflor.*  $\frac{1}{2}$  in. long. *Neuter flowers* spreading, close above the females.

Dehra Dun (Edgeworth); Fatehgarh (T. Hardwicke); Bundelkhand (Burkhill). Flowers during the hot weather, very foetid. *DISTRIB.* Punjab Plain and up to 5,000 ft. on the Himalaya and eastwards to Nepal; also in Bengal and in the Konkan and Deccan.

### 5. AMORPHOPHALLUS, Blume; *Fl. Brit. Ind.* vi, 513.

Tuberous herbs. *Leaves* appearing after the flowers, solitary, 3-partite, segments pinnatisect. *Spatha* with an open or convolute funnel-shaped or campanulate limb. *Spadix* exserted or included; appendage large, short or long. *Inflorescence* cylindric, dense-flowered, males and females contiguous, neuters none. *MALE* flowers. *Stamens* 2-4, anthers sessile, cells oblong, pores apical. *FEM.* flowers. *Ovaries* globose, 1-4-celled, style, short or long, stigma entire or 2-4-lobed; ovules solitary in each cell. subbasal,

anatropous. *Fruit* of subglobose or obovoid berries in clusters. *Seeds* exalbuminous, embryo macropodous.—Species 30-40, in the tropics of the old World.

*A. campanulatus*, Blume; *F. B. I.* vi, 513; *Watt. E. D.*; *Duthie and Fuller in Field and Garden Crops* iii, 6 t. 69; *Prain in Beng. Pl.* 1109; *Cooke Fl. Bomb.* ii, 825. *Arum campanulatum*, Roxb. *Fl. Ind.* iii, 509.—*Vern. Ol* (of native cultivators), *Zamingand*; *Nâghphanni-qand* (Punjab).

*Tuber* depressed-globose, much warted, 8-10 in. in diam. dark brown. *Leaves* appearing long after the flowers, 1-3 ft. broad; segment spreading, simple or forked; petioles 2-3 ft. long, stout, warted, dark-green with paler blotches; leaflets 2-5 in. long, obovate or oblong, acute, veins prominent. *Peduncle* stout, elongating in fruit sheaths linear-oblong. *Spatha* 6-10 in. broad, pointed, strongly and closely veined; margins recurved, undulate and crisped, greenish-pink externally and with pale blotches; base within purple. *Spadix* about as long as the spathe; appendage, variable in shape and in length up to 8 in., dark reddish purple. *Male inflor.* Sub-turbinate, about 3 in. long; anthers densely crowded. *Fem. inflor.* 3 in. long or more. *Ovaries* sessile, densely crowded, depressed-globose; style  $\frac{1}{2}$  in. long, stout, purple; stigma large, 2-3-lobed. *Berries* obovoid red, 2-3-seeded.

Largely cultivated within the Upper Gangetic Plain and often occurring as wild. It flowers early in the rainy season. *DISTRIB.*: Plains of the Punjab and Bengal, both wild and cultivated; also in the Bombay Pres. and southwards to Ceylon. The tuberous roots of this plant are much esteemed by the natives of India for their nutritious and wholesome properties. The small tuberosities which are found on the larger tubers are what they employ for sets, and are planted in the same manner as potatos are in England. (See Roxburgh in *Fl. Ind.* iii, 510).

#### 6. PLESMONIUM, Schott; *Fl. Brit. Ind.* vi, 518.

Tuberous herbs. *Leaves* solitary, appearing long after the flowers, 3-partite, segments pinnatisect. *Flowers* monceous. *Spatha* with an open funnel-shaped limb. *Spadix* included, appendage very small or none. *Inflorescence* cylindric, rather lax-flowered; males and females distant, with large obovoid pearl-like or turbinete neuters interposed, and with small slender

neuters scattered over the appendage (when present). MALE flowers: *Stamens* 2-4, anthers sessile; cells oblong; pores apical, confluent. FEM. flowers: *Ovaries* globose, 1-3-celled, style short, stigma 2-3-lobed; ovules solitary in each cell, subbasilar, anatropous. *Fruit* of red ovoid berries in clusters. *Seeds* exaluminous, embryo macropodous.

*P. margaritiferum*, Schott *Syn. Aroid.* 34; *F. B. I.* vi, 518; *Prain Beng. Pl.* 1110. *Arum margaritifer*, Roxb. *Fl. Ind.* iii, 512.—*Vern. Kharhar* (N. Oudh).

*Tubers* up to 6 in. in diam., white and covered with warts. *Leaves*  $1\frac{1}{2}$  ft. in diam.; leaflets few, 4-6 in. long, linear, acuminate; petiole  $1\frac{1}{2}$ -2 ft., green. *Peduncle* 12-18 in., stout, pale-green streaked with dark-green. *Spatha* 5-6 in. long by 4 in. broad, erect, broadly ovate, obtuse, concave, loosely convolute below the middle, pale yellowish green flushed with pink within, dark-purple at the base. *Spadix* stout, stipitate, obtuse, as long as the spathe. *Male inflor.* occupying the largest portion of spadix. *Anthers* very short pores confluent. *Neuter flowers* solid, obovate, smooth pearly-white, occupying about  $\frac{1}{3}$  of spadix between the anthers and the ovaries. *Fem. fls.*: *Ovaries* 2-3-celled, with one ovule in each; stigmas large, round.

Dehra Dun (Mackinnon); Siwalik range (Lowrie); Rohilkhand (Duthie) and eastwards through N. Oudh to Balrampur (Duthie and Burkhill); also in Bundelkhand (Duthie). *DISTRIB.*: Bengal at Dacca (C. B. Clarke); recorded also by Prain as occurring at Chota Nagpur and in C. and E. Bengal. Roxburgh mentions it under his *Arum margaritifer* (in *Fl. Ind.* iii, 512) as a native of Hindustan, whence it was introduced into the Calcutta Botanic Garden.

#### 7. COLOCASIA, Linn.; *Fl. Brit. Ind.* vi, 523.

Herbs, usually tall and coarse, tuberous or with a stout short caudex; leaves and flowers appearing simultaneously. *Leaves* peltate, ovate-cordate; petioles stout, sheathing below. *Flowers* monococious. *Spatha* on a stout axillary peduncle; tube thick, accrescent, persistent, the mouth constricted; limb erect, deciduous. *Spadix* shorter than the spathe, stout or slender; male and fem. inflorescence with usually interposed flat neuters, appendage cylindric or subulate. *MALE flowers.* *Stamens* 3-8, connate in an obpyramidal column with an angular flattened apex; anthers linear-oblong, dehiscing by terminal pores. *FEM. flowers.* *Ovary*

ovoid, 1-celled, stigma sessile, discoid. *Fruit* of small obconic or oblong berries. *Seeds* oblong, sulcate, albumen copious, embryo axile.—

Leaves with a bronze margin; spathe dark yellow . . . . . 1. *c. nymphæifolia*.  
 Leaves not bronze margined . . . . . 2. *c. Antiquorum*.

1. *C. nymphæifolia*, Kunth *Enum.* *iii*, 37; *F. B. I.* *vi*, 523 (*in part*); Watt *E. D.* *and in Comm. Prod. Ind.* 398; *Prain Beng. Pl.* *1112*. *Arum nymphæfolium*, Roxb. *Fl. Ind.* *iii*, 495; DC. *L'Orig. Pl. Cult.* 58.—Vern. *Sar Kachhu* (Beng).

2. *C. Antiquorum*, Schott; *F. B. I.* *vi*, 523 (*in part*); Watt *E. D.* *and in Comm. Prod. of India*, p. 398; *Prain Beng. Pl.* *1112*; Cooke *Fl. Bomb.* *ii*, 829; DC. *L'Orig. Pl. Cult.* 58; Duthie and Fuller *Field and Gard. Crops*, part *iii*, page 8, plate 75; Royle *Ill. Him.* 406; *Wight Ic. t.* 786; *Arum Colocasia*, Linn.; Roxb. *Fl. Ind.* *iii*, 494.—Vern. *Ghuiyan, gagli, Kachâlu*.

A tall coarse herb, tuberous or with a short stout caudex. *Leaves* large, ovate, with a broad triangular basal sinus. *Spathe* 8-18 in. long, caudate-acuminate, erect, pale-yellow. Roxburgh distinguishes 3 varieties besides *C. nymphæifolia*. They are 1, a dark one from wet places, in which the roots never swell, but send out many suckers and the leaves and petioles are more or less purple, it is much eaten; 2, one which grows on dry ground with dark purple or bluish clouds; 3, one like the last but all green. Of *nymphæifolia* which he describes as having repand leaves. He says that he doubts if it is anything but a large aquatic state abundantly wild on borders of lakes, with the subterraneous stem often as long and thick as a man's arm, reddish petioles peduncles and leaves, narrower leaves, and a shorter appendage; all the parts are eaten (*Fl. Brit. Ind.* *vi*, *l. c.* 523.) Under the name of *Târo* or *Tania* this plant, *Colocasia Antiquorum* is well-known in most tropical countries, and is much valued for its starchy tuberous rhizomes. It is best known in the United Provinces as *Ghuiyan*, and is much grown on the plains of the United Provinces, and up to 6,000 ft. on the outer Himalayan ranges.

#### 8. REMUSATIA, Schott; *Fl. Brit. Ind.* *vi*, 521.

Herbs with tuberous rhizomes, emitting long radical slender shoots clothed with small bulbils. *Leaf* solitary, appearing after

the flowers; lamina entire, peltate, petiole rather short. *Spatha* coriaceous, short-stalked; tube convolute, ovoid, accrescent over the fruit; limb broad or narrow, erect or spreading and reflexed, deciduous. *Spadix* very short, sessile; male and fem. inflorescence separated by neuters, appendage none. **MALE** inflorescence forming a clavate mass of densely packed angular flat-topped florets. **Stamens** each with a fleshy connective bearing 2-3 small anther-cells opening by terminal slits. **FEM.** florets forming a short cylindric inflorescence. *Ovary* ovoid, 1-celled; stigma sessile discoid; ovules many on parietal placentas, orthotropous. *Fruit* of small clustered berries. *Seeds* small, albuminous, embryo axile.—Species 2, in India and Java.

**R. vivipara**, Schott; *F. B. I. vi*, 521; *Prain Beng. Pl. II* 13; *Cooke Fl. Bomb. ii*, 828. *Arum viviparum*, Roxb. *Fl. Ind. iii*, 496.

*Tubers* 1-1½ in. in diam., in clusters from the crown; bulbiferous shoots 6-12 in. long, simple or shortly branched, ascending, flexuous, bearing at the nodes clusters of oblong squarrosely scaly bulbils  $\frac{1}{10}$ - $\frac{1}{4}$  in. long. *Leaves* peltate, 5 by  $3\frac{1}{2}$  to 18 by 12 in., membranous, orbicular-ovate or -cordate, acute or acuminate, with strong main nerves and fine venation between them; petiole 6-12 in. long, the sheath short. *Spatha* 4-5 in. long, coriaceous; tube 1-2 in. long, oblong or ovoid, green; limb 2-3 in. long, broadly orbicular-ovate or ovate-cordate, golden-yellow. *Spadix* 1-1½ in. long. **MALE** inflo.  $\frac{1}{4}$  in. long.

Dehra Dun, in shady ravines (Duthie). Eastwards along the Sub-Himalayan tracts in Rohilkhand and Northern Oudh (Duthie). **DISTRIB.**: Subtrop. Him. from Kumaon to Sikkim, up to 3,500 ft.; also on the Khasia Hills, and on Parasnath Hill in Chota Nagpur; Konkan and South to Ceylon and Java. The plant rarely flowers, but sends up long bulbiferous shoots from the crown of the tuber.

#### 9. SCINDAPSUS, Schott; *Fl. Brit. Ind. vi*, 541.

Robust climbing shrubs, tissues abounding in acicular needles. *Stems* rooting at the nodes. *Leaves* ovate oblong or oblong-lanceolate, petiole 3-6 in. long, sheathing, geniculate, the sheath often accrescent. *Flowers* 2-sexual, all fertile. *Spatha* boat-shaped, thick caducous. *Spadix* shorter than the spathe, sessile, cylind-

dric, dense-flowered. *Perianth* none. *Stamens* 4, filaments flattened and thicker upwards, anthers terminal; cells oblong, parallel or divaricate, dehiscing by lateral slits. *Ovary* prismatic or obpyramidal, 1-celled, flat on the top; stigma sessile. *Fruit* of fleshy obpyramidal berries in clusters, the apex coriaceous and ultimately separating. *Seed* more or less reniform, arillate at the base, testa hard, albumen none, embryo horse-shoe-shaped.—Species about 10, in Trop. Asia, Australia and Polynesia.

*S. officinalis*, Schott.; *F. B. I.* vi, 541; *Watt E. D.*; *Prain Beng. Pl.* 1114; *Kanjilál For. Fl.* (ed. 2), 414. *Pothos officinalis*, Roxb. *Fl. Ind.* I. 431.—*Vern. Poriabel* (Dehra Dun); *Gaj-pipal*.

Common in the sál forests of Dehra Dun and Saháranpur (*Kanjilál*, *Vicary*, *Duthie*), N. Oudh in the Kheri and Bahraich districts (*Duthie*). The leaves are eaten as a vegetable, the stems yield a fibre, and the berries are used medicinally. *DISTRIB.*: Trop. Himalaya, eastwards to Sikkim and Bengal, also in Burma and the Andamans.

#### CXVIII.—LEMNACEÆ.

Minute or small, gregarious, floating, aquatic herbs. *Fronds* with or without capillary roots. *Flowers* monococious, 1-3, naked or enclosed in a membranous spathe, perianth wanting. *Stamens* 1-2, anthers 1-2-celled. *Ovary* 1-celled; style short; stigma truncate or funnel-shaped; ovules 1-6, basal, anatropous, semianatropous or orthotropous. *Fruit* 1-several-seeded, indehiscent or opening transversely. *Seeds* minute, albuminous, embryo cylindric, axile. *Species* 19 in 3 genera, in still water throughout the world excluding the arctic regions.

Fronds with roots; inflorescence with spathe of 2 male and 1 female flower.

Fronds with several roots . . . . . 1. SPIRODELA.

Fronds with one root . . . . . 2. LEMNA.

Fronds without roots; inflorescence without spathe, of one male and one female flower 3. WOLFFIA

1. SPIRODELA, Schleid. Under *Lemna* Fl. Brit. Ind. vi, 556.

Fronds with several roots, the basal portion with two lateral pockets from one or both of which daughter shoots arise, these remaining united with the parent or becoming detached. Flowers appearing on the less vigorously growing side of the shoot, starting with a delicate ventral leaf (spathe) followed by a pair of anthers and a pistil. Anthers in an early stage 4-celled but soon appearing 2-celled. Ovary with 2 anatropous ovules. Species 2, one Indo-Malayan, the other widely distributed.

*S. polyrrhiza*, Schleid. *Lemna polyrrhiza*, Linn., Fl. Brit. Ind. vi, 557; *Prain Beng. Pl. 1117*; Cooke, Fl. Bomb., ii, 832. *L. orbiculata*, Roxb. Fl. Ind. iii, 565.

Fronds  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, broadly obovate or orbicular, rather thick, dark green above usually purplish beneath, roots several, up to 16, in a fascicle towards the basal end of the fronds. Spathe 2-lipped.

Dehra Dun (Parker) growing with *Azolla pinnata*, R. Br.

DISTRIB.: Temperate and tropical regions.

*S. oligorrhiza*, Hegelm. *Lemna oligorrhiza*, Kurz, with thinner narrower fronds and 2-5 roots may also occur. It is common in Bengal.

2. LEMNA, Linn.; Fl. Brit. Ind. vi, 556, *ex parte*.

Fronds with a single root. Ovary with 1-6 anatropous, semi-anatropous or orthotropous ovules. Otherwise as for *Spirodesla*. Species 5 in tropical and temperate regions.

Fronds entire, branches soon detached . . . . . 1. *L. paucicostata*.

Fronds serrulate at the tip, branches hastate persistent . . . . . 2. *L. trisulca*.

1. *L. paucicostata*, Hegelm. Fl. Brit. Ind. vi, 556; *Prain Beng. Pl. 1117*.

Fronds about  $\frac{1}{2}$  in. long, oblong or obovate-oblong, somewhat oblique at the basal end, rather thin, nearly flat on both sides. Root-sheath with a minute wing on either side at the base, root-cap acute; Ovule solitary, orthotropous.

Dehra Dun (Parker). Moradabad (Thomson). Merwara (Duthie 4899). Haldwani (Parker). Common on ponds and in shallow sluggish streams. Flowers October. DISTRIB.: Cosmopolitan, tropical.

2. *L. trisulca*, Linn. *Fl. Brit. Ind.* vi, 557; *Prain, Beng. Pl. 1117*; *Cooke, Fl. Bomb.* ii, 831.

Fronds  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, oblanceolate, the tip serrulate, daughter fronds hastately attached to the parent shoot. Root-cap acute. Ovule solitary, semianatropous.

Has not yet been collected in this area. DISTRIB.: Persia, Manipur, China, etc.

*Lemna gibba*, Linn. is mentioned in the *Fl. Brit. Ind.* as occurring throughout India but there seem to be no Indian specimens in herbaria. Fronds suborbicular, very convex and greenish-white beneath. Root-sheath elongate, cylindric, root-cap acute. Ovules 2-6, anatropous. Cooke, *Fl. Bomb.* ii, 832, records it for the Deccan.

3. **WOLFFIA**, Horkel; *Fl. Brit. Ind.* vi, 557.

The smallest of the flowering plants consisting of minute fronds producing a daughter shoot in the median line at the hinder end. Flowers breaking through the upper surface of the frond consisting of a single male flower or stamen and one female flower or pistil. Anthers in an early stage 2-celled but soon appearing one-celled. Ovary with one orthotropous ovule. Species 12, mainly tropical.

Fronds subglobose beneath . . . . . 1. *W. arrhiza*.

Fronds conical or subcylindric beneath . . . . . 2. *W. microscopica*.

1. *W. arrhiza*, Wimm. *Fl. Brit. Ind.* vi, 557; *Prain Beng. Pl. 1117*. *W. Michelii*, Schleid. *Cooke Fl. Bomb.* ii, 832.

Fronds  $\frac{1}{20}$  in. long, subglobose or somewhat oblong, convex above, globose beneath.

Dehra Dun (Parker). DISTRIB.: Europe, Bengal common, Kurz. Bombay Tanks throughout the presidency common, covering the water like a green scum, Cooke.

2. *W. microscopica*, Kurz. *Fl. Brit. Ind.* vi, 558; *Prain, Beng. Pl. 1117*.

Fronds  $\frac{1}{20}$  inch long, flat above with a more or less conical rootlike process beneath usually twice as long as the frond.

Dehra Dun (Parker) common, usually associated with *Lemna paucicostata* appearing earlier but ultimately replaced by *Lemna*. Flowers September. DISTRIB. : Punjab, Bengal.

### CXIX.—ALISMACEÆ.

Aquatic or marsh herbs, usually erect. Leaves radical or clustered at the nodes of floating stems, entire, petioled, sometimes pellucid-dotted or lineolate. Flowers pedicelled, 1- or 2-sexual or polygamous, rarely diœcious, arranged in umbellated or paniced whorls, usually white or pink; bracts 3 or more, membranous, bracteoles small. Perianth-segments 6, in 2 series; outer 3 herbaceous; inner petaloid, rarely absent. Stamens 6 or more, rarely 3, hypogynous or perigynous; anthers erect, basifixied, 2-celled, dehiscence by lateral or dorsal slits. Carpels 3-6 or more, free, 1-celled, sessile or stipitate on a flat or raised receptacle; style short or long, rarely none, subterminal or ventral, stigma simple; ovules 1 or more in each carpel, placentas on the inner angle or with a solitary basilar ovule. Fruit of small achenes or follicles. Seeds small or minute, exaluminous, embryo straight or conduplicate.—Species about 60, in temperate and tropical regions.

Fruit indehiscent, of 3 or more achenes; ovules and seeds solitary:—

Stamens few, 6-9; receptacle flat; flowers 2-sex . . . . .	1. ALISMA.
Stamens usually many, rarely as few as 6; receptacle globose or oblong; flowers 1-sex or polygamous . . . . .	2. SAGITTARIA.

Fruit dehiscent, of 6-7 follicles; stamens 8-12;  
fs. 2-sexual; ovules and seeds many . . . . . 3. BUTOMOPSIS

#### 1. ALISMA, Linn.; Fl. Brit. Ind. vi, 559.

Scapigerous stemless palustrine perennial herbs. Leaves lanceolate, cordate or sagittate. Flowers 2-sexual, in umbellated or paniced whorls, white or pink. Sepals 3, herbaceous persistent.

*Petals* 3, membranous, deciduous. *Stamens* 6 or 9, in two or three series; filaments filiform. *Carpels* few or many, receptacle small; stigma small, terminal; ovule solitary, anatropous, basilar. *Fruit* of few or many compressed or turgid coriaceous or hard achenes. *Seeds* erect, basilar, testa membranous, embryo horse-shoe-shaped.—Species 6, cosmopolitan.

Leaves linear-ovate-lanceolate or subcordate, 5-7-nerved; achenes membranous, compressed . . . . .

1. *A. Plantago*.

Leaves 11-17-nerved; achenes hard, turgid :—

Leaves coriaceous, orb-cordate or reniform with rounded lobes and rounded or emarginate apex . . . . .

2. *A. reniforme*.

Leaves membr., broadly ovate-cordate, with acute lobes and a narrow sinus . . . . .

3. *A. oligococcum*.

1. *A. Plantago*, Linn. *Sp. Pl.* 342; *F. B. I.* vi, 559; *Watt E. D.*; *Collett Fl. Siml.* 545; *Prain, Beng. Pl.* 1119.—Water Plantain.

*Rootstock* fleshy, swollen. *Leaves* radical, 6-8 in. long, erect or spreading, linear-ovate-lanceolate or subcordate, 5-7-nerved; petioles up to 10 in. long. *Scape* 1-4 ft. high, swollen and fleshy below. *Flowers* in panicled whorls,  $\frac{1}{2}$  in. in diam. *Sepals* oblong, spreading in fruit. *Petals* white or pink, the claws yellow. *Stamens* 6. *Achenes* 20-30 in a single whorl, membranous, compressed; style ventral, twice as long as the ovary, slender, deciduous.

Dehra Dun (Wallich). *DISTRIB.*: Outer Himalayan ranges in marshy ground from Kashmir eastwards, up to 7,000 ft.; also in N. Bengal, Manipur and Burma, extending to N. & S. Temp. regions.

2. *A. reniforme*, Don *Prod.* 22; *F. B. I.* vi, 560; *Prain Beng. Pl.* 1119; *Collett Fl. Siml.* 546 (in note).

*Leaves* coriaceous, 1 $\frac{1}{2}$ -4 in. long, often broader than long, orb-cordate or reniform, 13-17-nerved; tip rounded or emarginate; nervules very fine and close. *Scape* 1-3 ft. *Flowers* white,  $\frac{1}{2}$  in. in diam. in large whorled panicles, branches and pedicels long. *Sepals* as long as the petals, persistent, at length reflexed in fruit. *Achenes* 5-8, turgid, dorsally ribbed; endocarp thick, hard; style subterminal, slender, persistent.

Rohilkund near Pilibhit, and in the Bahraich district of N. Oudh (Duthie). DISTRIB.: Marshes in N. C. & E. Bengal; also in the Punjab Plain, ascending to 5,000 ft. in Kashmir and Kumaon; extending to the Khasia Hills and Australia, but not in Ceylon.

3. *A. oligococceum*, *F. Muell. Fragm. Phyt. Australi* i, 123; *F. B. I. vi*, 560; *Prain Beng. Pl.* 1119.

Leaves membranous, punctate, 3-6 in. long by 2-3 in. broad, broadly ovate-cordate, with acute lobes and a narrow sinus, 11-17 nerved; nervules distant. Panicle 6-9 in. long and broad; bracts herbaceous, very large, lanceolate, the lower ones 1-3 in. long. Flowers as in *A. Plantago*. Fruiting sepals reflexed. Achenes 2-6, turgid, dorsally keeled, keels tubercled; endocarp thick, hard; style very short, terminal, deciduous.

Moradabad (T. Thomson). DISTRIB.: Marshes, in the plains of Bengal and the Punjab, extending to the Swat Valley in the N. W. Frontier Province; also in Ceylon, Trop. Africa and Australia.

2. **SAGITTARIA**, Linn.; *Fl. Brit. Ind.* vi, 561.

Erect stemless aquatic herbs, usually perennial. Leaves long-petioled, elliptic cordate or sagittate. Flowers 1-sexual or polygamous, in panicled or spicate whorls. Sepals 3, herbaceous, persistent. Petals 3, membranous, deciduous, white. Stamens in male flowers about 24, with only staminodes in the female flowers, or 6-10 in the male flowers, with 9-12 in the hermaphrodite flowers; filaments filiform, compressed. Carpels very many, crowded on a large globose or oblong receptacle, laterally flattened, style ventral or apical, stigma papillose; ovules solitary, basilar. Fruit a globose or oblong head of flattened crested or winged achenes. Seeds erect or basilar, testa thin, embryo horseshoe-shaped.—Species about 15, in temperate and tropical regions.

Leaves rising above the surface of the water, hastate or sagittate; stamens about 24 in the male fls., reduced to staminodes in the fem. fls. . . . .

1. *S. sagittifolia*.

Leaves floating, broadly ovate, deeply cordate, obtuse; stamens 6-10 in the male fls., 9-12 in the 2-sex. fls. . . . .

2. *S. guayanensis*.

1. *S. sagittifolia*, Linn. *Sp. Pl.* 993; *Roxb. Fl. Ind.* iii, 645; *F. B. I.* vi, 561; *Watt E. D.*; *Prain Beng. Pl.* 1120; *Cooke Fl. Bomb.* ii, 834. *S. hastata*, *Don Prod.* 22. *Buchenau in Engl. and Prantl. Pflanzenf.* Vol. 2, p. 231, fig. 176.

*Rhizome* thick, stoloniferous. *Leaves* radical, 2-8 in. long, very variable, the first leaves of the young plants slender and very acute, the next one or two simply cordate-oblong, the rest sagittate, acute, smooth, with more or less divergent basal lobes which are 2-3-nerved and narrower than the upper part of the blade, which latter is oblong or lanceolate, 5-nerved, the nerves extending from the top of petiole to the apex of the leaf; petioles sometimes reaching nearly 2 ft. long, 3-gonous. *Scape* 6-18 in. long. *Flowers*  $\frac{1}{2}$ - $\frac{3}{4}$  in. diam., white, often with a purple claw, in 3-5 whorls along the scape, with usually 3 flowers in each whorl, the lower whorls female, the upper male, with longer pedicels; hermaphrodite flowers occur, but rarely; bracts narrowly ovate, membranous. *Sepals* ovate, acute, much smaller than the petals. *Petals* large, broadly obovate. *Filaments* in male flowers many; anthers sagittate. *Achenes* obliquely obovate, flattened, apiculate, winged, the wings broad, entire or subcrenate.

Ajmir (*Lourie*); Agra (*Monro*); Moradabad (*T. Thomson*); N. Oudh, Pilibhit and Gorakhpur (*Duthie*); Banda (*Edgew.*). *DISTRIB.*: In the Swat Valley and other localities of the N. W. Frontier Province. Plains of Punjab and Bengal; extending to Europe, N. Asia and N. America. The tuberous rhizomes are eaten in China, and the plant is often cultivated as a food-plant.

2. *S. guayanensis*, *H. B. K.*; *F. B. I.* vi, 561. *Prain Beng. Pl.* 1120. *S. cordifolia*, *Roxb.* iii, 647. *S. Lappula*, *Don Prod.* 22.

Petioles, scapes and pedicels often more or less hairy. *Leaves* membranous, floating, 1-2 in. long, broadly ovate, deeply cordate, obtuse; lobes broad, acute or obtuse; sinus broad or narrow; nerves radiating, obscure; petioles long or short. *Scape* 6-18 in. long. *Flowers*  $\frac{3}{4}$  in. in diam., white, in approximate irregular whorls; pedicels short, very stout; flowers of lower whorls usually ternate, 2-sexual, 9-12-androus; of the upper numerous and male and 6-10-androus. *Petals* obovate, erose. *Anthers* cordate at base. *Achenes* many, flat, surrounded by a broad toothed wing.

Moradabad (*T. Thomson*); D. Dun (*P. W. M.*); Banda (*Edgew.*). *DISTRIB.*: from the Punjab Plain to Bengal and Burma, but not in Ceylon; found in the Pen. and Malay Islands, also in China and in Trop. Australia.

## 3. BUTOMOPSIS, Kunth; Fl. Brit. Ind. vi, 562.

Annual erect scapigerous marsh herbs with milky juice. *Leaves* radical, elliptic-acute. *Flowers* 2-sexual, umbelled on a scape exceeding the leaves; whorls bracteate, sometimes superposed. *Perianth segments* 6, in two series. *Sepals* 3, herbaceous, persistent. *Petals* 3, larger than sepals, membranous, white, fugacious. *Stamens* usually 9, hypogynous, 6 outer in pairs opposite the sepals, sometimes one of a pair absent; 3 inner single, opposite petals, sometimes 1 or more replaced by a pair, filaments filiform, anthers oblong. *Carpels* 6-9, whorled on a flat receptacle, sessile and shortly connate below, 1-celled, style short, stigma somewhat external at apex of style; ovules many, small, on reticulate parietal placentas, ascending, anatropous. *Fruit* of 6-7 erect membranous follicles. *Seeds* many, minute, smooth; embryo conduplicate, horseshoe-shaped.—Species 2, in Asia, Africa and Tropical Australia.

*B. lanceolata*, Kunth *Enum. Pl. iii*, 165; *F. B. I. vi*, 562; *Prain Beng. Pl. 1920*; *Cooke Fl. Bomb. ii*, 835. *Butomus lanceolatus*, Roxb.; *Fl. Ind. ii*, 315.

*Rhizome* small, emitting leaves above and fibrous roots below. *Leaves* membranous, 2-6 in. long, elliptic lanceolate, acute, entire, narrowed into the petiole; main nerves 5-7; petioles dilated at base, up to 8 in. long. *Scape* usually longer than the leaves, stout, bearing an umbel of 3-20 flowers at its apex; bracts scarious, ovate, acute; pedicels very variable in length, 1-6 in. long. *Sepals* 3, herbaceous, elliptic, obtuse, reticulately veined, persistent. *Petals* white fugacious. *Follicles* 6-7, reticulately veined, tapering into short beaks. *Seeds* many, oblong, with rounded ends, dark brown, shining.

Merwara (A. E. Lourie), Moradabad (T. Thomson). *DISTRIB.*: Plains of India and South to Bombay Presidency; also common in Bengal rice-fields; extending to Australia.

## CXX.—NAIADACEÆ.

Marsh herbs, stemless, scapigerous, rootstock tuberous or creeping or aquatic submerged or floating. *Leaves* sheathing at the

base. *Flowers* 1-or 2-sexual, usually green and inconspicuous, in spikes, racemes or terminal or axillary peduncled spadices; bracts small or 0. *Perianth* 0 or of 3-4 inferior, valvate segments or tubular and very delicate. *Stamens* 1-6, hypogynous, free in 2-sexual, solitary or connate in male flowers; anthers 1-2-celled. *Carpels* 1-6; ovules 1 or more in each carpel, erect or pendulous; style long or short; stigmas 2-3 capillary or more often simple. *Fruit* of utricles, achenes, follicles or small drupes. *Seed* erect, pendulous or laterally peltate, testa coriaceous or somewhat fleshy, albumen 0, embryo fleshy, straight. *Species* about 150, temperate and tropical.

*Flowers* 2-sexual, perianth of 1-4 sepals.

Sepals 1-3, white or coloured; stamens 6 or more . . . . . 1. APONOGETON.

Sepals 4, green; anthers 4, sessile . . . . . 2. POTAMOGETON.

*Flowers* 1-sexual, perianth 0 or hyaline.

Style long with oblique peltate stigma, achenes 2-9 . . . . . 3. ZANNICHELLIA.

Style 0, stigmas 2-4, achene solitary . . . . . 4. NAIAS.

**1. APONOGETON**, Thunb.; Fl. Brit. Ind. vi, 564.

Scapigerous, aquatic herbs, rootstock tuberous crowned by numerous root fibres. Leaves oblong or linear-lanceolate, floating or submerged. *Flowers* bisexual on long scapes bearing solitary or geminate often unilateral spikes which when young are enclosed in a conical fugacious sheath. *Perianth* of 1-3 equal or unequal white or coloured segments or obsolete. *Stamens* 6 or more; filaments subulate, unequal, persistent; anthers didymous. *Carpels* 3-6, each 2 or more ovuled; style short or 0; stigma discoid or decurrent, persistent; ovules basal, anatropous. *Fruit* of coriaceous follicles. *Seeds* oblong or cylindric, sometimes ribbed. *Species* about 22, Africa, Madagascar, tropical Asia and Australia.

Leaves floating, spikes dense, carpels 4-8-seeded . . . . .

1. *A. monostachyon*.

Leaves mostly submerged, spikes not dense, carpels 1-2-seeded . . . . .

2. *A. crispum*.

1. *A. monostachyon*, Linn. *f. Suppl.* (1781) 214; Roxb. *Fl. Ind.* ii, 210; *F. B. I.* vi, 564; Watt, *E. D.*; Prain, *Beng. Pl. 1122*; Cooke *Fl. Bomb.* ii, 837. *A. natans* (L.) Engl. and Krause, *Pflanzenr. iv*, 13, p. 11. Vern. Jechu.

Rootstock  $\frac{1}{2}$ - $\frac{1}{2}$  in. diam, stoloniferous, edible. *Leaves* 2 $\frac{1}{2}$ -8 in. long by  $\frac{2}{3}$ - $\frac{1}{2}$  in. floating, oblong or linear-oblong, base cordate, acute or rounded at the apex, with 3-5 nerves on either side of the midrib and distinct cross nerves, petiole slender, subtrigonous much longer than the blade. *Spike* solitary densely flowered. *Sepals* obovate,  $\frac{1}{10}$  in. long about as long as the stamens. *Stamens* 6, anthers bluish-purple. *Carpels* 3. *Follicles* exceeding the sepals, seeds 4-8, longitudinally ribbed.

Throughout the plains (Royle.) Like most water plants this has been seldom collected, I have seen none from the Gangetic Plain.  
DISTRIB.: Behar (Hope), S. India (Wight), N. Australia.

2. *A. crispum*, Thunb. *Nov. Gen. iv* (1781) 78; *F. B. I.* vi, 564; Prain, *Beng. Pl. 1122*. *A. undulatum*, Roxb. *Fl. Ind.* ii, 211.

Rootstock  $\frac{1}{2}$ - $\frac{1}{2}$  in. diam, stoloniferous, edible. *Leaves* mostly submerged, blade linear-lanceolate or oblong, 4-6 inches long or longer, 3-7 longitudinal nerves and numerous fine cross nerves, petiole compressed, shorter than the blade. *Spike* solitary, the flowers dense at first but ultimately rather lax. *Sepals* oblong,  $\frac{1}{8}$  inch long, about twice as long as the stamens. *Stamens* 6. *Carpels* usually 3. *Seeds* oblong usually 1, sometimes 2, smooth.

The plains, Saharanpur. DISTRIB.: Bengal, Burma.

2. **POTAMOGETON**, Linn.; *Fl. Brit. Ind.* vi, 565; P. Ascherson and P. Græbner, *Pflanzenreich*, IV, 11.

Annual or perennial aquatic herbs, rootstock creeping. *Leaves* submerged or the upper floating, opposite or alternate, stipules intrapetiolar. *Flowers* bisexual, small, greenish, in spikes on an axillary or leaf-opposed peduncle arising from a membranous sheath, bracts 0. *Perianth* of 4 concave green valvate segments (sometimes regarded as outgrowths of the connectives). *Stamens* 4, anthers sessile at the base of the perianth-segments, didymous. *Carpels* 4, free, sessile; ovule one, campylotropous from the inner angle of the carpel; stigma subsessile or decurrent, persistent.

*Fruit* of 4 coriaceous or spongy drupelets, seed subreniform. *Species* about 85 with very numerous hybrids, cosmopolitan.

- Upper or all leaves floating.
- Floating leaves 3-4 inches long . . . . . 1. *P. indicus*.
- Floating leaves  $\frac{1}{2}$ - $1\frac{1}{2}$  inches long . . . . . 2. *P. javanicus*.
- Leaves all submerged.
- Leaves ovate, cordate, amplexicaul . . . . . 3. *P. perfoliatus*.
- Leaves linear-oblong, semiamplexicaul,  
        translucent 3-nerved . . . . . 4. *P. crispus*.
- Leaves filiform, opaque . . . . . 5. *P. pectinatus*.

1. *P. indicus*, Roxb. *Fl. Ind.* I (1820) 452; *F. B. I.* vi, 565; *Prain, Beng. Pl.* 1123; *Cooke Fl. Bomb.* ii, 837.

Stem terete. Leaves submerged up to 6 in. by  $1\frac{1}{2}$  in. lanceolate, very thin, with about 7 nerves on either side of the midrib, acute, narrowed into a rather stout petiole about 1 in. long, floating  $2\frac{1}{2}$ -4 by 1- $1\frac{1}{4}$  in. oblong, elliptic or elliptic-lanceolate, rounded or acute at both ends, rather thick, opaque with many slender longitudinal nerves; petioles 1-5 in. long, rather stout; stipules 1- $1\frac{1}{2}$  in. long. Spikes  $1\frac{1}{2}$ -2 in. long, dense. Sepals  $\frac{1}{10}$  in. long including the claw, limb suborbicular, concave. Drupelets scarcely  $\frac{1}{8}$  in. long, oblique, shortly beaked, 3-ribbed on the back.

Throughout the area, common, Dehra Dun, Agra, Merwara, Pilibhit, Kheri, Bahraich, etc. Flrs. Jan.-June. DISTRIB.: Throughout India, Baluchistan, Ceylon, etc.

2. *P. javanicus*, Hassk. in *Act. Soc. Ind.-Needrl.* I (1856) 26; *F. B. I.* vi, 566; *Prain, Beng. Pl.* 1123; *Collett, Fl. Siml.* fig. 179.

Stems very slender. Leaves submerged very narrowly linear  $\frac{1}{10}$  in. wide, floating  $\frac{2}{3}$ - $1\frac{1}{2}$  in. long, elliptic-oblong or elliptic-lanceolate, acute at both ends or subobtuse, 2-3-nerved on either side of the midrib; petiole about  $\frac{1}{2}$ - $\frac{1}{3}$  in. long; stipules about  $\frac{1}{2}$ -1 in. long. Spikes  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, not very dense. Sepals  $\frac{1}{10}$  in. long, orbicular-obovate. Drupelets  $\frac{1}{12}$  in. long including the short slightly hooked beak (style), 3-ribbed on the back, the ribs often denticulate.

Dehra Dun (Mackinnon). DISTRIB.: Africa, S. & E. Asia, Australia.

3. *P. perfoliatus*, Linn. *Sp. Pl.* (1753) 126; *F. B. I.* vi, 566; *Cooke Fl. Bomb.* ii, 838.

Stem terete, sparingly branched. Leaves usually 1-1½ in. long, sessile, amplexicaul, ovate or ovate-lanceolate, cordate, obtuse, membranous translucent, 5-7-nerved on either side of the midrib; stipules small, caducous. Spikes dense at first becoming laxer, up to 1 in. long. Sepals  $\frac{1}{16}$  in. long including the distinct claw, limb elliptic-obovate. Drupelets  $\frac{1}{8}$  in. long, obliquely ovoid, scarcely keeled, with a distinct usually hooked beak.

Throughout the area, common. Dehra Dun, Bundelkhand (Duthie). Flowers apparently all the year round. DISTRIB.: N. Hemisphere and Australia.

4. *P. crispus*, Linn. Sp. Pl. (1753) 126; F. B. I. vi, 566; Prain, Beng. Pl. 1123; Cooke Fl. Bomb. ii, 838.

Stems slender, compressed, branched. Leaves 1-2½ by  $\frac{1}{8}$ - $\frac{3}{8}$  in. linear or linear-oblong, crisped and finely serrulate, translucent, sessile, 3-nerved; stipules small caducous. Spikes up to  $\frac{1}{2}$  in. long, few-flowered, lax. Sepals  $\frac{1}{16}$  in. long including the claw, limb suborbicular. Drupelets  $\frac{1}{8}$  in. long, obliquely ovoid, tipped with a compressed curved beak.

Throughout the area. Dehra Dun, Moradabad, Agra, Kheri. Flrs. March, April. DISTRIB.: Cosmopolitan except S. America.

5. *P. pectinatus*, Linn. Sp. Pl. (1753) 127; F. B. I. vi, 567; Prain, Beng. Pl. 1123; Cooke Fl. Bomb. ii, 838. *P. pusillus*, subsp. *flabellatus*, Hook. f. F. B. I. vi, 567.

Stems filiform, usually much dichotomously branched. Leaves 1-4 by  $\frac{1}{16}$  in. or much narrower usually 3-nerved with the lateral nerves close to the recurved margins; stipules sheathing with short free points, 2 in. long or less. Spikes about an inch long, flowers few in distant whorls. Sepals  $\frac{1}{16}$  in. long, limb broadly obovate. Drupelets  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, oblique, broadly ovate or almost semicircular with a very short beak, scarcely keeled.

Throughout the area. Saharanpur, Agra, Merwara. Flrs. October, March (probably all the year round). DISTRIB.: as for *P. crispus*.

*P. filiformis*, Pers. Synops. I (1805), 152; A. Bennett, Journ. Bot. XXXIII (1895), 372.

Closely resembles *P. pectinatus*. Leaves filiform 1-nerved. Drupelets  $\frac{1}{16}$  in. long.

Gwalior (Maries in Herb. Mus. Brit.) fide Bennett, l. c. I have not seen this species from our area.

3. **ZANNICHELLIA**, Linn.; Fl. Brit. Ind. vi, 568. Græbner,  
Pflanzenreich IV, 11, p. 153.

Aquatic slender herbs of brackish or fresh water. *Leaves* submerged, linear, pseudoverticillate at the flowering nodes; stipules amplexicaul or sheathing. *Flowers* monoeious, minute. *Male flowers* pedunculate, perianth 0, anthers adnate to the excurrent connectives. *Female flowers* with a hyaline cupular perianth, carpels 1-8 usually 4, style short or long, stigma peltate, ovule solitary, pendulous. *Fruit* of compressed coriaceous carpels, seed oblong. *Species* 2; absent only in Australia.

**Z. palustris**, Linn. Sp. Pl. (1753) 969. F. B. I. vi, 568; Prain Beng. Pl. 1124; Cooke Fl. Bomb. ii, 840.

Stem filiform, rooting. *Leaves*  $\frac{1}{2}$ -3 in. long  $\frac{1}{4}$ - $\frac{1}{2}$  in. wide. *Peduncle*  $\frac{1}{2}$  in. long. *Fruit*s distinctly stipitate, tipped with a long style. Dehra Dun (Parker). Punjab: Central Provinces: Behar (Hooker).

4. **NAIAS**, Linn.; Fl. Brit. Ind. vi, 568.

Submerged annual aquatic herbs. *Leaves* opposite or whorled, sessile. *Flowers* minute, usually monoeious. *Male flowers* perianth double, outer tubular or inflated, entire or 4-fid or wanting, inner hyaline. *Stamen* 1, adnate to the inner perianth, anther 4-, rarely 1-celled. *Female flowers* perianth 0 or hyaline and adnate to the solitary sessile carpel, style cylindric, stigmas 2 or 3, ovule basal erect anatropous. *Fruit* an oblong achene. *Seed* hard, embryo straight. *Species* 32, cosmopolitan.

Leaves coarsely toothed, almost pinnatifid.

Flowers diceious . . . . . 1. *N. marina*.

Leaves finely toothed. Flowers monoeious.

Leaves with 6-10 teeth on each side. Anthers 1-celled . . . . . 2. *N. minor*.

Leaves with 30-50 minute spinules on either side. Anthers 4-celled . . . . . 3. *N. graminea*.

1. *N. marina*, Linn. Sp. Pl. (1753) 1015; Rendle, Pflanzenr. IV, 12, 7. 2. *N. major*, Allione. F. B. I. vi, 569; Prain, Beng. Pl. 1125.

Stem rather stout (for the genus), toothed, fragile. Leaves  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, subternately whorled, linear, almost pinnatifidly toothed, teeth 4-8 on either side and a few on the back; sheath with rounded sides entire or minutely denticulate. Outer perianth (or spathe) present in the male flowers. Anthers 4-celled.

There are no specimens from the area but as it is found in Kashmir, Afghanistan, Sind, Central Provinces, Bengal, etc., it is certain to occur. DISTRIB. Cosmopolitan.

2. *N. minor*, Allione, Fl. Pedem. ii (1785) 221; F. B. I. vi, l.c. 14. 569; Prain, Beng. Pl. 1125; Cooke, Fl. Bomb. ii, 840; Rendle,

Stem very slender, much-branched, fragile. Leaves  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, very narrowly linear, teeth small 6-10 or in vigorous examples 12-15 on either side; sheath rounded or truncate, toothed. Outer perianth present in the male flowers. Anthers 1-celled.

Bundelkhand (Duthie 7092). Haldwani (Parker). DISTRIB. C. & S. Europe and N. Africa to Japan.

3. *N. graminea*, Del. Fl. Egypte (1812) 282, t. 50, fig. 3; F. B. I. vi, 569; Prain Beng. Pl. 1125; Rendle, l. c. 18.

Stem slender, fragile, internodes short towards the apex of the stem making the plant plumose. Leaves  $\frac{3}{4}$ - $1\frac{1}{2}$  in. long, ternately whorled or fascicled, very narrowly linear or subulate, teeth very minute 30-50 on either side; sheath with prominent erect linear, denticulate auricles. Outer perianth wanting in both sexes. Anthers 4-celled. Dehra Dun (Parker) common. Flrs. Aug.-Sept. DISTRIB. most parts of the old world.

### CXXI.—ERIOCAULACEÆ.

Marsh or aquatic scapigerous herbs. Leaves in arrow with sheathing bases, grass-like, rosulate when the stems are short. Flowers very minute, in involucrate heads, bracteate, unisexual, usually monococious, perianth inferior. Male flowers: sepals 2-3, free, or connate and equally or spatheaceously divided; petals 2-3, equal or unequal, often very obscure, inserted on the top of a clavate

elongate stipes or corolla-tube; stamens 6 or fewer, some often reduced to filaments, anthers dorsifixed; pistillode minute or 0. *Female flowers*: sepals 2-3, usually free, caducous; petals 3, rarely 2 or 0, persistent, spatulate or oblanceolate, usually ciliate or villous and with a black gland; ovary free 3-, rarely 2-celled, ovules solitary in the cells, pendulous, orthotropous, style 1, stigmas 3-2, slender, with sometimes interposed lobes or appendages. *Fruit* a membranous loculicidal capsule, testa coriaceous, striolate and often papillose, embryo outside the floury albumen. *Genera* 9, species 550, mainly tropical.

ERIOCAULON, Linn.; Fl. Brit. Ind. vi, 571.

Petals free in both sexes. Stamens twice as many as petals (or fewer by abortion). *Species* over 200, tropical and subtropical

Anthers white; heads glabrous . . . 1. *E. Sieboldianum*.

Anthers black.

Heads more or less villous.

Involucral bracts obtuse.

Heads  $\frac{1}{2}$ - $\frac{1}{3}$  in. diam. floral  
bracts not acuminate;  
female sepals boat-shaped 2. *E. trilobum*.

Heads  $\frac{5}{8}$ - $\frac{1}{2}$  in. diam. floral  
bracts long acuminate;  
female sepals very narrow 3. *E. quinquangulare*.

Involucral bracts acute . . . . 4. *E. pseudoquinquangulare*.

Heads glabrous . . . . . 5. *E. Hamiltonianum*.

1. *E. Sieboldianum*, Sieb. et Zucc. ex Steud. *Syn. Pl. Cyp. II* (1855) 272; *F. B. I. vi*, 577; *Prain, Beng. Pl. 1127*; *Cooke, Fl. Bomb. ii*, 845; *Collett, Fl. Siml. 549*, t. 180. *Ruhland in Pflanzenr. IV*, 30, p. 111, fig. 15 A-G.; *Fyson Journ. Ind. Bot. III*, 15 t. 50, 51.

Annual. Leaves  $\frac{1}{2}$ -2 in. long, narrowly linear, subulate or setaceous. *Scapes* 1 $\frac{1}{2}$ -5 in. high, slender; heads  $\frac{1}{6}$ - $\frac{1}{3}$  in. diam. globose or ovoid, glabrous, pale or sometimes purplish; bracts glabrous, scarious, obtuse, shorter than the heads; receptacle columnar, glabrous and nearly so. *Floral bracts* similar to the involucral but narrower and

subacute, pale or dark, usually with a dark central band and narrow scarious margins. *Male calyx* spathaceous, limb ovate, acute, irregularly tridentate; petals very minute; anthers white. *Female sepals* 3, 2 or 0, narrow; petals 0; style long, stigmas 3, filiform.

Dehra Dun (Duthie, etc.) abundant in rice fields, Saharanpur, Moradabad (Thomson), Dholpur (Jameson), Shahjahanpur (Duthie).  
DISTRIB. : Throughout India, China, Japan.

2. *E. trilobum*, *Buch. Ham. ex Koern. in Linnæa XXVII* (1856) 645; *F. B. I. vi*, 583; *Prain, Beng. Pl. 1127*; *Cooke Fl. Bomb. ii*, 848; *Ruhland, l. c. 74*; *Fyson, Journ. Ind. Bot. II*, 206, *t. 10*. *E. Sollyanum*, *Royle, Ill. Bot. Himal.* (1839) 409, *t. 97. f. 1.*

Stem 0. Leaves 1-3 by  $\frac{1}{10}$ - $\frac{1}{5}$  in. linear ensiform, not red when dry. *Scapes* 3-8 in. high; heads  $\frac{1}{5}$ - $\frac{1}{6}$  in. diam. globose, blackish grey, somewhat white villous; bracts oblong, obtuse, glabrous, pale brown, at first radiating beyond the head ultimately reflexed; receptacle columnar, villous. *Floral bracts* narrowly obovate-cuneate, obtuse or acute but not acuminate, blackish-green with short white hairs on the back. *Male calyx* with the 3 sepals connate to about the middle in a spathe; petals stipitate, minute; anthers black. *Female sepals* obovate-oblong, boat-shaped, more or less keeled, with white hairs on the back; petals narrowly linear-spathulate; style divided half way down into 3 filiform branches.

Shahjahanpur (Duthie 4476, mixed with *E. Sieboldianum*) Lalitpur (Duthie 7049). Throughout India from Dharamsala to Bengal and south to Malabar; Madagascar, Zanzibar.

NOTE.—Under the Vienna Conference rules the name for this plant should be *E. Sollyanum*, Royle, but I have thought it better to adhere to the name used in Ruhland's Monograph and all Indian floras.

3. *E. quinquangulare*, *Linn. Fl. Zeyl.* (1747) 48; *F. B. I. vi*, 582; *Prain, Beng. Pl. 1127*; *Cooke Fl. Bomb. ii*, 849; *Ruhland, l. c. 85*; *Fyson, Journ. Ind. Bot. ii*, 204, *t. 9.*

Stem short or 0. Leaves 1-4 by  $\frac{1}{10}$ - $\frac{1}{5}$  in. linear ensiform, usually reddish when dry. *Scapes* numerous 3-8 in. high; heads  $\frac{1}{5}$ - $\frac{1}{6}$  in. diam. globose or somewhat ovoid, densely white villous; bracts obovate or cuneate, obtuse, glabrous, pale straw-coloured, ultimately reflexed; receptacle globose or columnar, villous. *Floral bracts* similar to the involucral but narrower and long acuminate, light or dark brown. *Male calyx* spathaceous, oblong-spathulate, obtuse,

tip penicillate; petals stipitate, minute, pilose; anthers black. *Female sepals* narrowly oblanceolate-spathulate, hairy; petals similar but narrower; style short, branches 3, long, filiform.

Bundelkhand (Duthie 7048). DISTRIB. Throughout India except the arid N. W. and in Ceylon.

4. E. *pseudoquinquangulare*, Ruhl. *Pflanzenr. IV*, 30 (1903), 73.

Stemless. *Leaves* 2-3 by  $\frac{1}{2}$  in. linear, acute. *Scapes* 4-9 in. high, numerous; heads  $\frac{1}{2}$  in. diam. globose, densely white villous; bracts oblong-lanceolate, acute, glabrous, reflexed, yellowish-grey; receptacle pilose. *Floral bracts* obovate-oblong, acuminate, black, hairy on the back. *Male sepals* connate high up in a spathe, acute, ciliate, greenish black; petals ciliate; anthers black. *Female sepals* obovate acute, boat-shaped, crested; petals linear-oblong, ciliate; style short, branches 3.

Saharanpur (Botanic Gardens, Lehmann) fide Ruhland, I have not seen this species the description being taken from Ruhland.

5. E. *Hamiltonianum*, Mart. in Wall. *Pl. As. Rar. III* (1832) 29; Ruhland, l. c. 107; Fyson *Journ. Ind. Bot. II*, 313, t. 33.

Stemless. *Leaves* 2-3 $\frac{1}{2}$  in. long, linear-lanceolate. *Scapes* 4-10 in. high, numerous; heads  $\frac{1}{2}$ - $\frac{1}{4}$  in. diam. conical, glabrous, yellowish brown; bracts obovate, obtuse, glabrous; receptacle pilose. *Floral bracts* cuneate-obovate, more or less acuminate, yellowish. *Male sepals* 2, falcate-oblong, acute, glabrous; petals 0; anthers black. *Female sepals* 2, free, similar to the male; petals 3, linear, obtuse; style with 3 short filiform branches.

Dehra Dun (King) fide Fyson l. c. III, p. 106. I have seen no specimens from our area. DISTRIB. Assam.

## CXXII.—CYPERACEÆ.

Grass or rush-like herbs. *Stems* solid, very rarely with nodes, usually triquetrous. *Leaves* 3-farious or wanting, usually near the base of the stem; sheaths tubular usually closed; ligule 0 or a short prolongation of the mouth of the sheath opposite the blade. *Flowers* minute, 1-2-sexual, solitary in the axils of scales ("glumes")

forming "spikelets" that are solitary or variously arranged. *Perianth* 0 or of hypogynous bristles or scales. *Stamens* 1-3, anthers linear, basifixed, filaments flattened. *Ovary* 1-celled, superior, style with 2-3 stigmatic branches. *Fruit* a compressed or trigonous nut. *Seed* erect, embryo small, basal, median, enclosed in the floury albumen. Plants of wet or marshy situations universally distributed.

Nut not enclosed in a utricle.

Flowers 2-sexual.

Flowering glumes distichous.

Glumes usually many, rachilla of spikelet persistent.

Stigmas 3, nut triquetrous . . . . .

1. *Cyperus.*

Stigmas 2, nut flattened.

Nut latterly compressed *i.e.*, its greatest width radial to the rachis . . . . .

2. *Pycreus.*

Nut dorsally compressed *i.e.*, its greatest width tangential to the rachis . . . . .

3. *Juncellus.*

Glumes few, rachilla of spikelet deciduous.

Stigmas 2, nut compressed . . . . .

4. *Kyllinga.*

Stigmas 3, nut triquetrous.

Fertile glumes 1-3, winged . . . . .

5. *Courtoisia.*

Fertile glumes 1-12 not winged . . . . .

6. *Mariscus.*

Flowering glumes spirally arranged or sometimes the lowest subdistichous.

Style-base constricted or articulated above the nut.

Leaves 0, hypogynous bristles almost always present . . . . .

7. *Heleocharis.*

Leaves usually present, hypogynous bristles 0.

Leaf-sheaths usually glabrous, style persistent or if deciduous not leaving a button on the nut . . . . .

8. *Fimbristylis.*

Leaf-sheaths with long fine hairs, style glabrous deciduous leaving a button on the nut . . . . .

9. *Bulbostylis.*

Style-base passing gradually into the nut, sometimes deciduous and leaving a small apiculus.

Bristles linear, filiform or 0 . . . . . 10. *Scirpus*.

Bristles 2-seriate, the inner scale-like or 0 . . . . . 11. *Fuirena*.

Bristles 6, cut into narrow segments 12. *Eriophorum*.

Bristles 2, scale-like enclosing the nut . . . . . 13. *Lipocarpha*.

Flowers 1-sexual, nut bony usually white or pale, polished . . . . . 14. *Scleria*.

Nut enclosed in a utricle . . . . . 15. *Carex*.

1. **CYPERUS**, Linn.; Fl. Brit. Ind. vi, 597.

Perennial or annual herbs, tufted or with creeping root-stocks. Leaves usually only at the base of the stem, occasionally reduced to sheaths. Spikelets in solitary globose or umbellate heads or spikes, bracts one or more, leafy, immediately below the inflorescence, bracteoles usually similar but smaller below the secondary divisions of the inflorescence. The spikelets composed of several or many distichous glumes the two lowest being empty and differing in size and shape from the rest which are equal and deciduous from below upwards, the uppermost 1-3 sterile or empty. Hypogynous bristles 0. Stamens 1-3; anthers linear or oblong, sometimes apiculate or crested. Ovary usually trigonous; style short or long or 0, branches 3. Nut trigonous, rarely compressed or globose. Species about 300 in all warm and temperate regions.

The following key cannot be used for depauperated specimens which can only be identified by comparison with normally developed ones.

I. Spikelets digitate or clustered not spicate or racemose.

Annuals, slender or cæspitose.

Flowering glumes mucronate . . . . . 1. *C. uncinatus*.

Flowering glumes obtuse.

Spikelets in dense compact heads . . . . . 2. *C. difformis*.

Spikelets in twice compound umbels.

Nut globose, white . . . . . 3. *C. flavidus.*  
Nut triquetrous, brown . . . . . 4. *C. amabilis.*

Perennials.

Spikelets white or pale straw-colour in heads . . . . .

Spikelets in compound umbels, leaves broad . . . . . 5. *C. niveus.*  
6. *C. diffusus.*

II. Spikelets spicate (sometimes very shortly) rarely subracemose.

A. Annuals.

Spikelets very shortly spicate.

Spikelets  $\frac{3}{4}$  in. long; stamens 3. 7. *C. compressus.*

Spikelets usually  $\frac{1}{2}$  in. long;  
Stamen 1 . . . . . 8. *C. aristatus.*

Spikelets in an elongate subracemose spike . . . . . 9. *C. Irica.*

B. Perennials.

Inflorescence a large compound umbel.

Bracts (the longest) usually much exceeding the inflorescence.

1. Spikelets  $\frac{1}{2}$  in. long or less  
Rachis of the spikes glabrous.

(a) Spikelets numerous in an elongate spike.

Rachilla of spikelets narrowly winged . . . . . 10. *C. eleusinoides.*

Rachilla of spikelets conspicuously winged.

Wings of rachilla persistent.

Spikes digitate 11. *C. radiatus.*

Spikes at least  
some pedun-  
cled . . . . 12. *C. exaltatus*.

Wings of rachilla  
deciduous . . . 13. *C. digitatus*.

(b) Spikelets 3-8 in short  
spikes.  
Stem at base nodo-  
sely thickened,  
spikelets usually  
dark colored . . . 14. *C. rotundus*.

Stem at base not  
nodose, spikelets  
usually pale  
yellowish-brown. 15. *C. esculentus*.

Rachis of the spikes scab-  
rid pilose . . . . 16. *C. pilosus*.

2. Spikelets  $\frac{1}{2}$  in. long and  
over.  
Spikelets numerous in  
elongated spikes.  
Spikelets  $\frac{1}{2}$ - $\frac{3}{4}$  in.  
broad, glumes dis-  
tinctly overlapping.  
Rachilla not winged,  
spikelets rather  
remote . . . . 17. *C. procerus*.

Rachilla winged,  
spikelets crowded 18. *C. tegetum*.

Spikelets very slender,  
glumes  $\frac{1}{6}$  in. long,  
not or only slightly  
overlapping . . . . 19. *C. distans*.

Spikelets 3-8 in. short  
spikes . . . . . 14. *C. rotundus*.

Bracts of the inflorescence half  
as long as the rays or less . . . 20. *C. corymboeus*.

Inflorescence congested rays if pre-  
sent short. (See also *C. rotun-  
dus*) . . . . . 21. *C. bulbosus*.

1. *Cyperus uncinatus*, Poir, *Encyc. Method.* v, 7, 247. (1806) Cooke, *Fl. Bomb.* ii, 862; Collett, *Fl. Siml.* 554. *C. cuspidatus*, H. B. K. *Nov. Gen et Sp.* i, 204 (1815); F. B. I. vi, 598; Prain, *Beng. Pl.* 1141.

A slender annual glabrous plant,  $1\frac{1}{2}$  ins. to 6 ins. in height with several to many flowering stems. *Leaves* all arising from near the base narrowly linear, apex tapering above to an acute or acuminate apex,  $1\frac{1}{2}$  ins. or less in length,  $\frac{1}{30}$  in. broad, sheaths pale to reddish brown, soon split down one side but not becoming fibrous. Each stem ending in a compact nearly globose head  $\frac{1}{4}$  to  $\frac{5}{8}$  in. in diameter of 5 to 23 sessile spikelets, or, most often, several of the spikelets are replaced by branches which themselves end in heads of spikelets; bracts of the principal head 3 to 6, leaf-like but usually longer. *Spikelets* 8 to 20 flowered, up to  $\frac{3}{8}$  in. long. *Glumes*, when spread open, ovate,  $\frac{1}{20}$  in. long, chestnut brown, keel with 3 nerves of which the middle one is much the most pronounced, all three unite in the upper part of the glume and pass into a strong outwardly curved mucro  $\frac{2}{5}$  in. long. *Stamens* 3. *Nut* obovoid, sharply 3-angled and with 3 flat faces. *Style* with 3 slender branches  $\frac{1}{25}$  in. long.

Dehra Dun (Gammie); Saharanpur; Shahjahanpur (Duthie); Moradabad (Thompson). *DISTRIB.* Throughout India and in most warm regions of the world.

2. *Cyperus difformis*, L. *Sp. Pl.* 67; F. B. I. vi, 599; Prain, *Beng. Pl.* 1142; Collett *Fl. Siml.* 554. Cooke, *Fl. Bomb.* ii, 862.

An erect annual glabrous herb, usually 10 to 12 ins. high but up to 20 ins. roots numerous, fibrous, tufted. Stem-bases covered with loose membranous, not fibrous sheaths. Stems finely striated longitudinally, smooth. *Leaves* usually shorter than the stem, about  $\frac{1}{8}$  in. broad, smooth, flaccid. *Inflorescence* consisting of about 3 to 6 compact heads of spikelets nearly globose,  $\frac{1}{8}$  to  $\frac{1}{4}$  in. diam. one or more of the heads sessile the rest rayed, rays up to  $1\frac{1}{2}$  ins. long, often shorter; primary bracts 3 to 4, leaf-like but frequently broader. *Spikelets* about  $\frac{1}{8}$  in. long or less, and  $\frac{1}{30}$  in. broad, 10-30 flowered those with fewer flowers turgid in appearance, axis much flattened laterally, without wings. *Glumes* closely imbricate, very concave, about  $\frac{1}{35}$  in. long, more or less red on the sides, with a very obtuse or almost rounded apex. *Stamens* 1 or 2. *Nut* trigonous, obovoid, pale-brown, not much shorter than the glume; style shorter than the nut, branches short.

Dehra Dun (Duthie); Bundelkhand (Duthie); Moradabad (Thomson); Merwara (Duthie); Ajmer (Lowrie); Gwalior (Maries); Shahjahanpur (Duthie); Saharanpur. DISTRIB. Throughout India and the warmer parts of the E. Hemisphere.

3. *Cyperus flavidus*, Retz. Obs. Fasc. v. (1789) 13; F. B. I. vi, 600; Prain, Beng. Pl. 1142; Cooke, Fl. Bomb. ii, 862.

An erect annual glabrous plant. Roots fibrous, tufted. Stem bases covered with close-fitting not fibrous pale-brown sheaths. Stems tufted, longitudinally striated, 6 to 8 ins. high. Leaves linear, acute, often longer than the stems, about  $\frac{1}{2}$  in. broad or broader. Inflorescence a twice compound umbel; primary rays up to  $3\frac{1}{2}$  ins. long; primary bracts leaf-like but often broader, generally much over-topping the inflorescence and up to 7 ins. long. Spikelets linear, up to  $\frac{1}{4}$  in. long but usually shorter,  $\frac{1}{8}$  in. broad. The two lowest glumes smaller and empty; flowering glumes oblong-ovate, rounded at the apex,  $\frac{1}{5}$  in. long and slightly less broad, with a green obscurely nerved back and broad hyaline margins. Stamens 1 or 2. Nut ovoid-globose, white, about  $\frac{7}{50}$  in. long, trigonous, shortly stipitate, style with its three branches  $\frac{1}{4}$  in. long, divided about half-way down.

Moradabad (Thomson); Bundelkhand (Duthie); Abundant in rice fields throughout India and generally distributed in the warmer regions of the Old World.

4. *C. amabilis*, Vahl. Enum. ii (1806) p. 318; F. B. I. vi, 598; Prain, Beng. Pl. 1141.

Annual, slender, tufted, stems 2-10 in. high, striate. Leaves all arising from near the base, one half the length of the stem or less,  $\frac{1}{2}$  in. broad with narrow filiform curved tips, sheaths dark brown or purplish, the older fibrous. Inflorescence usually a large compound umbel, rarely reduced to a single head, rays up to 4 in. long, primary bracts about 4, the longest as long as the rays, leaf-like. Spikelets  $\frac{2}{3}$ - $\frac{3}{4}$  in. long,  $\frac{1}{10}$ - $\frac{1}{12}$  in. broad in clusters of 3-10, each about 30 flowered, rachilla not winged. Glumes closely imbricate in flower, laxer and spreading in fruit,  $\frac{1}{10}$  in. long, narrowly boat-shaped, keel 3-nerved, excurrent as a very small mucro, sides thin smooth golden-brown or chestnut. Stamen 1. Nut  $\frac{1}{3}$  in. long, ellipsoid or obovoid, triquetrous, brown, style scarcely longer than the nut, branches short.

Moradabad (Thomson) fide Clarke. DISTRIB: Tehri-Garhwal (Gamble); Kumaon (Davidson), most tropical countries.

5. *C. niveus*, Retz. *Obs. Fasc. 5* (1789) 12; *F. B. I. vi*, 601; *Prain, Beng. Pl. 1142*; *Collett Fl. Siml. 555*; *Cooke Fl. Bomb. ii*, 864.

A perennial erect glabrous herb. Rhizome horizontal short woody, almost entirely composed of the bulb-like stem-bases and giving off long slender fibrous roots below. Stem-bases nodose and covered with dark-brown non-fibrous leaf sheaths the lowest of which are devoid of blades; each nodose stem-base gives rise to a tuft of leaves and a single simple slender smooth longitudinally striated stem up to 20 ins. long but generally shorter and terminating in a single head of spikelets. Leaves narrowly linear, tapering to an acutely triangular apex, nearly as long as or decidedly shorter than the stem,  $\frac{1}{12}$  in. broad, margins finely serrulated. Head of 3 to 13 spikelets, simple, more or less spheroidal, up to  $1\frac{1}{2}$  ins. in diameter, usually less; primary bracts 2-3 leaf-like, narrow, unequal, up to  $2\frac{1}{2}$  ins. long. Spikelets linear, or linear-lanceolate, much compressed, up to 1 in. long and  $\frac{1}{8}$  in. broad, white or pale straw coloured. The lowest glume generally empty and somewhat reduced; flowering glumes 16 to 40 in each spikelet, ovate-lanceolate, subobtuse,  $\frac{1}{8}$  in. long and  $\frac{1}{8}$  in. broad when spread out, markedly compressed with a sharp keel right to the apex, 5 to 6 parallel nerves on each side of the keeled midrib. Stamens 3, filaments  $\frac{1}{8}$  in. long, anthers linear, muticous. Nut obovoid-ellipsoid  $\frac{1}{16}$  in. long, triquetrous. Style with its branches  $\frac{1}{8}$  in. long, divided about half way down.

Moradabad (Thomson); Saharanpur (Lowrie); Kheri (Inayat); Bahraich (Inayat); Gonda (Inayat); Gorakhpur (Harsukh); Pilibhit (Inayat); Agra; Ajmere (Lowrie). Northern India south to Hyderabad and Eastwards to China.

6. *C. diffusus*, Vahl, *Enum. ii* (1806) p. 321; *F. B. I. vi*, 603; *Prain, Beng. Pl. 1142*.

Perennial, rhizome short roots wiry. Stems 8-30 in. high, sharply triquetrous, clothed at the base with fibrous sheaths. Leaves about as long as the stem  $\frac{1}{2}$ - $\frac{2}{3}$  in. wide, thin, dark green above paler beneath, somewhat scabrid on the margins and on the prominent vein on either side of the midrib. Inflorescence a usually decompound umbel 4-12 in. diam. bracts several, broad, leaflike, the longest exceeding the rays. Spikelets  $\frac{1}{2}$ - $\frac{1}{2}$  in. long in digitate clusters of 2-9 with some solitary on slender pedicels; rachilla with narrow persistent wings. Glumes  $\frac{1}{16}$  in. long and broad, boat-shaped, prominently mucronate, keel green 3-5-nerved, margins brown or white. Stamens 2-3. Nut  $\frac{1}{16}$  in. long, ellipsoid, triquetrous, black, style with its branches  $\frac{1}{16}$  in. long, divided almost to the base.

Haldwani (Parker). DISTRIB: Bengal, Assam and all moist tropical regions.

7. *C. compressus*, L. Sp. Pl. 68; F. B. I. vi, 605; Prain, Beng. Pl. 1143; Cooke Fl. Bomb. ii, 866; Collett Fl. Siml. 556.

An erect glabrous caespitose herb up to 14 ins. high. Roots tufted numerous fine. The stem bases are covered with red-purple usually entire and not fibrous leaf-sheaths. Leaf-blades often as long as the stems, narrowly linear  $\frac{1}{2}$  in. wide, gradually tapering in the upper part to a fine acuminate apex. Inflorescence umbellate, some of the rays, usually 3 or 4, developed up to  $3\frac{1}{2}$  ins. long, occasionally all the spikelets grouped as a sessile umbel; bracts leaf-like, unequal 3 or 4 longer than or as long as the primary rays of the umbel. Spikelets strongly compressed laterally, 4 to 7 in each ultimate condensed umbellate spike,  $\frac{5}{8}$ - $\frac{3}{4}$  in. long,  $\frac{1}{2}$  in. wide, grey-green streaked with crimson, the rachis very much flattened and with hyaline wings. The 2 or 3 lowest glumes small hyaline empty, the flowering glumes broadly ovate when spread out,  $\frac{3}{20}$  in. long,  $\frac{4}{15}$  in. broad at widest part, strongly keeled in upper part the keel running out into a stiff straight mucro, the wings with several obscure nerves. Stamens 3. Nut broadly triquetrous, obovoid, with 3 prominent angles and 3 concave sides, dark brown  $\frac{3}{20}$  in. long, style with branches  $\frac{3}{10}$  in. long, divided about halfway down.

Moradabad (Thomson); Dehra Dun (Duthie); Cawnpore (Duthie); Saharanpur (Royle); Bundelkhand (Duthie). DISTRIB.: Throughout India and most warm countries.

NOTE.—According to Clarke, the rachilla is not winged but in fresh specimens I find the glumes continuing down the rachilla as distinct and rather broad wings. This plant is a common rains weed in Dehra Dun.

8. *C. aristatus*, Rottb. Descr. et Ic. 23, t. 6, fig. 1; F. B. I. vi, 606; Prain, Beng. Pl. 1143; Cooke Fl. Bomb. ii, 866; Collett Fl. Siml. 556.

A small annual herb up to 8 ins. high. Numerous tufted fibrous roots. The lower parts of the flowering stems clothed with generally red glabrous not fibrous sheaths. Stems several to numerous, erect glabrous with fine longitudinal striations. Leaves all arising near the bases of the stems; sheaths with transversely truncate mouths; blades linear, tapering towards an acute apex, up to 2 ins. in length; smooth. Inflorescence primarily umbellate with usually one sessile

head and 2 or 3 rays ending in head-like spikes of spikelets, occasionally very much reduced so as to consist of a single sessile spike, primary bracts 3 to 4, leaf-like, unequal in length. Spikes dense of 6 to 25 spikelets, about  $\frac{1}{2}$  in. or less in length and  $\frac{1}{2}$  in. or less in diam. Spikelets linear-oblong each with about 12 flowers; the 2 lowest glumes empty and somewhat smaller than the flowering ones; flowering glumes oblong-ovate, suddenly narrowing into a recurved acuminate apex which is from  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of the rest of the glume, whose total length is  $\frac{1}{2}$  in. Stamen 1 (always?). Nut narrowly obovoid,  $\frac{1}{15}$  in. long, brown, smooth, style with its 3 branches about as long as the nut.

Cawnpore (Duthie); Dehra Dun (Duthie); Moradabad (Thomson); Agra; Saharanpur. DISTRIB: Most tropical countries including most of India.

NOTE.—This plant has been often mistaken for *C. uncinatus*, Poir. but in that species the glumes are keeled and have smooth hyaline margins. It also has 3 stamens. The glumes in *C. aristatus* are not keeled though the midrib is prominent and the hyaline margins are longitudinally striate in dry specimens (not in fresh ones).

9. *C. Iria*, *L. Sp. Pl. 45*; *F. B. I. vi, 606*; *Prain, Beng. Pl. 1143*; *Collett Fl. Siml. 556*; *Cooke, Fl. Bomb. ii, 867*.

An erect glabrous annual up to 20 ins. or more in height, each plant producing 1 to 6 flowering stems which are sharply triangular and longitudinally striated. Leaves arising from near the base of the stem with long pale brown to reddish brown entire sheaths, blades linear varying considerably in length and breadth according to habitat, up to 14 ins. long and  $\frac{1}{2}$  in. broad but usually very much less, gradually tapering to an acuminate apex, rather flaccid. Inflorescence primary a compound umbel 2-20 ins. in diameter, primary rays up to 8 ins. in length and often branched again in an umbellate manner; primary bracts up to 6, leaf-like, often very long and broad, more or less unequal. Spikelets, in typical plant, 8-15 flowered arranged along the ultimate rhachis in a spicate manner, the rhachis of the spikelets furnished between the glumes with narrow hyaline wings. The two lowest glumes empty small hyaline except for the midrib. Flowering glumes broadly boat-shaped, blunt or shortly apiculate  $\frac{1}{15}$ - $\frac{1}{2}$  in. long, midrib of 3-5 nerves, wings nerveless. Stamens generally 2. Nut triquetrous, ellipsoid in outline, black  $\frac{1}{2}$  in. long. Style and branches short.

Saharanpur (Duthie); Moradabad (Thomson); Dehra Dun (Duthie, Gamble); Cawnpore (Duthie); Jhansi (Duthie); Aligarh (Duthie),

DISTRIB: In many parts of India, especially in rice fields and in the warmer parts of the Old World.

var. *PANICIFORMIS* C. B. Cl. in F. B. I. vi. p. 607.

Spikelets short reduced to 2-4 nut-bearing flowers and arranged on the ultimate inflorescence branch in a narrow drawn out spike.

Aligarh (Duthie); Moradabad (Thomson); Saugor C. P. (Witt.).

10. *C. eleusinoides*, *Kunth Enum.* ii, 39; *F. B. I.* vi, 608; *Cooke Fl. Bomb.* ii, 868.

An erect glabrous perennial with a short horizontal rhizome covered with scale sheaths which tend to break up into fibres. Stem bases covered with leaf-sheaths of which the outermost tend to become fibrous at the base; sheaths closed with truncate mouth; blades linear tapering in the upper part to an acuminate apex, up to 2 ft. long and  $\frac{3}{8}$  in. broad but usually much less, midrib conspicuous and sharply keeled below, 2 lateral veins prominent on the upper surface. Flowering stem sharply triangular. Inflorescence a compound umbel with primary rays up to 7 ins. long (very unequal); primary bracts numerous leaf-like, very various in length and breadth, 3 or 4 usually longer than the inflorescence; ultimately the spikelets arranged in a spicate manner. Spikelets linear about  $\frac{1}{2}$  in. long and  $\frac{1}{16}$  in. broad, pale brown in colour; each internode of the rachis laterally flattened with a broad hollow which holds the nut and is surrounded on two sides by hyaline wings. The two lowest glumes usually empty and reduced flowering glumes elliptic when spread out, acuminate, with a broad keel. Stamens 3. Nut ellipsoid-trigonous,  $\frac{1}{16}$  in. long; style divided into 3 branches almost to the base.

Dehra Dun (Duthie); Moradabad (Thomson); Merwara (Duthie, Lowrie); Saharanpur (Royle). DISTRIB: Most of India south of the Himalaya, Ceylon; tropical and warmer parts of Asia, Africa and Australia.

11. *C. radiatus*, *Vahl. Enum.* ii, 369; *F. B. I.* vi, 617; *Prain, Beng. Pl.* 1145.

An erect glabrous herb 1-6 ft. high. Stem-bases covered with dark red-brown not fibrous leaf-sheaths, stems triquetrous striated smooth. Leaves linear tapering to an acuminate apex up to  $\frac{2}{3}$  the length of the stem  $1\frac{1}{2}$  in. wide smooth or with a slight asperity on the margins, midrib and two chief lateral veins. Inflorescence a compound umbel with the spikelets ultimately arranged in sessile spikes;

primary rays 1 to 3 ins. long; primary bracts 4 to 6, leaf-like but rougher, unequal in length; bracts of secondary umbel narrowly linear, acuminate; spikelets cylindrical averaging  $\frac{1}{6}$  in. long, rachilla with hyaline wings. The two lowest glumes empty hyaline broadly suborbicular; flowering glumes suborbicular in outline when spread open  $\frac{1}{2}$  in. long, apex rounded, the keel running out into an acute apiculus, nerves very obscure. *Stamens* 3. *Nut* ellipsoid in outline, acutely trigonous about  $\frac{1}{2}$  the length of the glume; style divided more than half way down, with the 3 branches about  $\frac{1}{2}$  in. long.

Agra (Munro). *DISTRIB.*: Gangetic Plain to Malay Peninsula, Africa, America.

**12. *C. exaltatus*,** *Retz. Obs. v. 11*; *F. B. I. vi*, 617; *Prain, Beng. Pl. 1145*; *Collett Fl. Siml.* 558; *Cooke Fl. Bomb. ii*, 872.

A tall glabrous herb up to 3 ft. in height, with numerous adventitious roots; stem bases covered with dark brown not fibrous sheaths, triquetrous, smooth, striated. Leaf-blades linear, tapering to an acuminate apex, up to as long as the stems or shorter,  $\frac{1}{2}$ - $\frac{1}{4}$  in. broad, slightly rough on the margins. *Inflorescence* a once or twice compound umbel of spikes, primary rays up to 6 ins. long; spikes usually 1 to 2 ins. long; primary bracts up to 6 in number, leaf-like, unequal, secondary bracts much shorter and narrower. *Spikelets* linear, from  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, rachilla with narrow persistent wings. The two lowest glumes in each spikelet narrow, linear, and empty, usually persistent. *Glumes* broadly ovate when spread out, with a prominent mucro,  $\frac{1}{2}$  in. long, chestnut-brown with a green keel, obscurely 3 nerved. *Stamens* 3. *Nut* ellipsoid in outline, less than  $\frac{1}{2}$  the length of the flowering glume, with 3 prominent angles; style divided about  $\frac{1}{2}$  way down, with the 3 branches  $\frac{1}{2}$  in. long.

Moradabad ((Thomson); Agra; Shahjahanpur (Duthie); Bundelkhand (Duthie); Aligarh (Duthie); Merwara (Duthie). *DISTRIB.*: Most parts of India and general in trop. and sub-trop. regions.

**13. *C. digitatus*,** *Roxb. Fl. Ind. i*, 205; *F. B. I. vi*, 618; *Prain, Beng. Pl. 1145*; *Cooke, Fl. Bomb. ii*, 873.

A tall glabrous herb,  $1\frac{1}{2}$  to 4 ft. high. Rhizome short horizontal. Stem triquetrous above, smooth, striated, covered at the base with coarse not fibrous usually dark leaf-sheaths. Leaf-blades linear tapering above to an acuminate apex, variable in length and width,

sometimes as long as the stem, often shorter, up to  $\frac{1}{2}$  in. broad, smooth, midrib well marked and keeled below, numerous lateral veins. *Inflorescence* a compound umbel of spikes, primary rays  $\frac{1}{2}$  to 7 ins. long very unequal in the same inflorescence; primary bracts 6 to 8, leaf-like often broad at the base, unequal in length and width the largest much longer than the rays; secondary bracts narrower. Spikes 1 to 2 ins. long composed of numerous spikelets which for the most part do not overlap but spread at right angles. Spikelets linear usually about  $\frac{1}{2}$  in. long rarely much longer, narrow hyaline wings are decurrent down the rachilla from the flowering glumes. Lowest glumes empty, narrower and more hyaline than the rest; flowering glumes oblong-elliptic when spread out, apex obtuse with the rounded nerved reddish green keel running out into a short apiculus, sides hyaline. *Stamens* 3, anthers narrowly linear-oblong, scarcely crested. *Nut* oblong-ovoid, about half the length of the glume; style divided to about the middle, with the 3 branches about  $\frac{1}{5}$  in. long.

Moradabad (Thomson); Dehra Dun (Royle); Pilibhit (Inayat).  
DISTRIB: From Punjab to Assam, Ceylon and most tropical regions.

14. *C. rotundus*, *L. Sp. Pl.* 45; *F. B. I.* vi, 614; *Prain, Beng. Pl.* 1145; *Cooke Fl. Bomb.* ii, 871; *Collett Fl. Siml.* 557.

An erect glabrous very variable herb from a few inches to 2 or 3 feet in height. Stem bases usually thickened in a nodose manner and passing below abruptly into a stiff rhizome and covered with the more or less fibrous remains of the leaf-sheaths; stolons slender 3 to 4 ins. or more in length covered with usually loose fitting brown cataphylls which are many nerved and split right down one side; subterranean tubers ovoid about  $\frac{1}{2}$  in. long and hard. Leaves usually shorter than the stem, linear, tapering in the upper part to a slender acuminate apex, from  $\frac{1}{2}$  to  $\frac{1}{4}$  in. broad. *Inflorescence* an umbel of more or less condensed spikes, the primary rays mostly developed but varying considerably, from  $\frac{1}{2}$  to 4 ins. in length; bracts leaf-like, unequal, about three usually exceeding the umbel. Spikelets from  $\frac{1}{2}$  to  $1\frac{1}{2}$  in. long, about  $\frac{1}{2}$  in. broad, most often dark chestnut brown in colour sometimes pale straw-colour, the glumes decurrent down the rachis of the spikelets as hyaline wings. *Glumes* boat-shaped, obtuse or subacute with a slight mucro,  $\frac{2}{3}$  in. long, keel rounded with several nerves. *Stamens* 3. *Nut* ovoid-ellipsoid in outline, with 3 flat or very slightly concave sides,  $\frac{1}{2}$  in. long, style with its 3 branches  $\frac{1}{5}$  in. long, divided more than half-way down.

Bahraich (Harsukh) ; Meerut (Thomson) ; Dehra Dun (Duthie, Gamble and others) ; Etawah ; Pilibhit (Inayat) ; Kheri, Saharanpur, Agra, Ajmer (Lowrie) : DISTRIB. : Throughout India and all warm regions.

**15. *C. esculentus*, *L. Sp. Pl. 67* ; *F. B. I. vi*, 616.**

An erect glabrous herb up to 20 ins. in height with slender subterranean stolons more or less covered with acute rather hard strongly veined scales and ending in ovoid to cylindrical edible tubers up to  $\frac{3}{4}$  in. in length. Stem-base pale brown, leaf-sheaths not fibrous, stems triquetrous, smooth, finely striated. Leaf-blades shorter than the stems, linear and gradually tapering in the upper part to a fine acuminate apex,  $\frac{1}{8}$  to  $\frac{1}{4}$  in. in width. Inflorescence primarily umbellate, of sessile and peduncled spikes the rays up to 3 ins. in length, primary bracts about 4, unequal, leaf-like, the longest up to 4 ins. or more. Spikes rarely exceeding 1 in. and most often simple, the first glumes (or secondary bracts) of the lowest spikelets sometimes with a short narrow leafy blade. Spikelets linear, about  $\frac{1}{2}$  in. long or shorter,  $\frac{1}{16}$  in. wide ; rachis slender with narrow hyaline wings. The two lowest glumes of each spikelet linear-lanceolate, acuminate. Flowering glumes boat-shaped, with a rounded or slightly emarginate apex,  $\frac{1}{8}$  in. long,  $\frac{1}{16}$  in. in breadth when spread out, 3 lateral nerves on each side of the keel nerve. Stamens 3. Style divided to below the middle, with its three branches  $\frac{1}{16}$  in. long. Nut obovoid-ellipsoid in outline with 3 sharp angles,  $\frac{1}{16}$  in. long.

Moradabad (Thomson) ; Dehra Dun (Duthie). DISTRIB. : From the Ganges Plain to the Nilgiri Mountains. S. Europe, Africa, America.

**16. *C. pilosus*, *Vahl, Enum. ii* (1806) *p. 354* ; *F. B. I. vi*, 609 ; *Prain, Beng. Pl. 1143*.**

Perennial, stolons long with distant nodes and scales. Stems 2-3 ft. high, acutely triquetrous, clothed at the base with the loose membranous sheaths. Leaves  $\frac{2}{3}$  of the length of the stem or sometimes exceeding it,  $\frac{1}{3}$  in. wide, seabrid on the margins. Inflorescence a simple or once compound umbel, primary rays usually about 2 in. long but variable sometimes 9 in. long, primary bracts 3-5, unequal, the longest up to 15 in. leaf-like, rachis of the spikes hispid-pilose. Spikelets  $\frac{1}{8}$ - $\frac{1}{4}$  in. long,  $\frac{1}{16}$  in. broad, crowded, straw-colored or reddish, spreading at right angles to the rachis. The lowest glume usually converted into a setaceous bract of variable length. Flowering glumes scarcely  $\frac{1}{16}$  in. long broadly ovate when spread flat, tip rounded but the obscure keel minutely excurrent, 3-7-nerved on the

back. *Stamens 3.* *Nut*  $\frac{1}{20}$  in. long, acutely trigonous, black, apiculate, style with its branches  $\frac{1}{2}$  in. long, divided more than half way down.

Dehra Dun (Parker) fairly common. Haldwani (Parker). *DISTRIB.:* Old World tropics.

**17. *C. procerus*, Rottb. Desc. et Icon. (1773) p. 29, t. 5; F. B. I. vi, 610; *Prain, Beng. Pl.* 1143.**

Perennial, stolons elongate, clothed with long acuminate scales. Stems 2-3 ft. long, acutely triquetrous, clothed at the base with the membranous somewhat fibrous sheaths. Leaves often exceeding the stem, thick coriaceous or somewhat spongy  $\frac{1}{2}$ - $\frac{3}{4}$  in. wide. *Inflorescence* a simple or once compound umbel of spikes, primary rays 1-4 in. long, primary bracts about 3 very unequal, the longest up to 15 in. leaf-like. *Spikelets*  $\frac{1}{2}$ -1 in. long,  $\frac{1}{8}$  in. broad, not crowded, straw-colored or reddish, spreading at right angles to the rachis, rachilla flattened, not winged. *Glumes* broadly elliptic in outline when spread flat, boat-shaped, sides and tip with a narrow hyaline margin, 2-3 nerved on either side of the closely 3-nerved keel,  $\frac{1}{10}$ - $\frac{1}{8}$  in. long. *Stamens 3.* *Nut* obovoid, trigonous,  $\frac{1}{8}$  in. long, yellowish-brown, style with its branches  $\frac{1}{6}$  in. long, divided more than half way down.

Dehra Dun (Parker). The only specimen from our area has the rachis of the spikes scabrous-pilose (var. *lasiorrhachis*, C. B. Clarke). *DISTRIB.:* Eastwards to Indo-China and south to Java.

**18. *C. tegetum*, Roxb. Fl. Ind. i, 208; F. B. I. vi, 613; *Prain Beng. Pl.* 1144; *Collett Fl. Siml.* 557; *Cooke Fl. Bomb.* ii, 870.**

An erect glabrous plant. Rhizome short horizontal, covered with dark-brown cataphyllary sheaths which may later become somewhat fibrous; the main adventitious roots wiry and bearing numerous much branched lateral roots. Stem-bases covered with pale-brown, membranous, often rather long, not fibrous sheaths with very oblique mouths; stems solitary leafless except at the base, up to 5 ft. high but generally shorter, with fine longitudinal striations. Leaves with the blades generally much reduced giving a rush-like appearance to the plant, when present the blades vary considerably in length and in breadth according to the luxuriance of the plant, margins serrulated, midrib conspicuous glabrous. Rays of the primary umbel 1 to 6 ins. long, ending in spikes or panicles of spikelets, the secondary rays often with a tubular cladophyll

at the base. *Spikelets* up to  $\frac{5}{8}$  in. long,  $\frac{1}{10}$  in. broad, up to 30 flowered; the flowering glumes are produced laterally beyond their central point of insertion as 2 well marked, deciduous, reddish brown subhyaline wings. *Glumes* oblong-ellipsoid obtuse,  $\frac{1}{8}$  in. long,  $\frac{1}{20}$  in. broad, keel rounded, green with 3 to 5 nerves, sides chestnut brown without nerves and with narrow scarious margins. *Stamens* 3; anthers linear up to  $\frac{1}{15}$  in. long often shorter, slightly crested. *Nut* oblong-ellipsoid  $\frac{1}{16}$  in. long, trigonous; style with its 3 branches  $\frac{1}{8}$  in. long divided low down.

Bundelkhand (Duthie No. 6488, 6488a, 6487, 7050); Jhansi (Duthie); Gwalior (Maries); Haldwani (Parker). Throughout India, Burma and Ceylon.

19. *C. distans*, *L. f. Suppl. 103*; *F. B. I. vi*, 607; *Prain, Beng. Pl. 1143*; *Collett, Fl. Siml. 557*.

An erect glabrous plant averaging 2 ft. in height with a usually short and horizontal rhizome and stolons with dark brown elliptic acute imbricating scales. Stem bases covered with pale brown persistant leaf-sheaths which have the truncate or slightly oblique mouths closed. Leaves varying considerably in length and breadth and texture according to habitat, usually shorter than the flowering stem and from  $\frac{1}{12}$  to  $\frac{1}{8}$  in. broad, the midrib prominent on the lower surface and two lateral veins on the upper. The inflorescence usually large, much branched, and up to 13 ins. in diameter but frequently more reduced; the primary and secondary rays are arranged in an umbellate manner and are of unequal lengths in the same inflorescence, the primary being up to 8 ins. long; the spikelets arranged in a loose spicate manner on the ultimate branches; primary and secondary bracts leaf-like, unequal, about 6, the primary often much longer than the inflorescence and correspondingly broad. *Spikelets*  $\frac{3}{8}$  to 1 in. long,  $\frac{1}{15}$  in. broad, spreading nearly at right angles when mature, glumes scarcely overlapping, rachis slender glabrous with hyaline wings on the sides of the internodes opposite the glumes. *Glumes* broadly elliptic in outline when spread open rounded at the apex  $\frac{1}{12}$  in. long,  $\frac{1}{15}$  in. in breadth, red in colour, keel rounded with 3 nerves. *Stamens* 3. *Nut* narrowly ellipsoid trigonous,  $\frac{1}{20}$  in. long, dark brown to black; style with branches  $\frac{1}{10}$  in. long, the undivided part short.

Moradabad (Duthie); Dehra Dun (Duthie); Saharanpur (Royle); Merwara; Haldwani (Parker). *DISTRIB.*: Throughout most of India and the warmer parts of the world.

20. *C. corymbosus*, *Rotib. Descr. et Ic.* 42, t. 7, fig. 4. *F. B. I.* vi, 612; *Prain, Beng. Pl.* 1144; *Cooke Fl. Bomb.* ii, 870.

A tall glabrous rush-like plant. Rhizome more or less horizontal, completely covered with broad, brown, loose, sheathing scales which are generally not fibrous, from below rather stout adventitious roots arise. Stem-bases covered with brown to straw-coloured generally not fibrous sheaths with oblique mouths, the upper ones long and often ending in a more or less developed blade; stems up to 5 ft. in height, smooth, longitudinally striated, trigonous, with sharper edges towards the apex. Leaf-blades usually much reduced but sometimes well developed and linear, acute with serrated margins. Inflorescence primarily umbellate, the primary rays up to 8 in. long and some very short, the primary rays again sometimes branch in a subumbellate manner and sometimes end in spikes of spikelets; primary bracts 2 to 3 leaf-like up to  $\frac{1}{2}$  the length of the inflorescence but usually markedly shorter than it, the secondary bracts are usually tubular sheaths. Spikelets up to 1 in. long but generally shorter, linear, pale-brown or straw-coloured, from 10 to 40 flowered. The two lowest glumes smaller, flowering glumes ovate when spread out, sub-obtuse,  $\frac{1}{8}$  in. long,  $\frac{1}{15}$  in. broad, keel broad, rather rounded with several nerves, sides scarious. Stamens 3, anthers linear, mucilous. Nut  $\frac{1}{16}$  in. long narrowly obovoid, trigonous; style with its 3 branches  $\frac{1}{8}$  in. long divided about half way down.

Bundelkhand, Jhansi (Duthie), Gonda (Inayat). DISTRIB: Northern India, Ceylon and most of tropical Asia, Africa and America.

21. *C. bulbosus*, *Vahl, Enum.* ii, 342; *F. B. I.* vi, 611; *Cooke, Fl. Bomb.* ii, 871. *C. jeminicus*, *Retz. Obs.* iv, 11, non *Rotib.*

An erect perennial glabrous herb; slender thread-like stolons up to 3 ins. long; bulbs when mature covered with black sharply acuminate scale-leaves. Leaves arising all in the lower part of the stem, about  $\frac{1}{2}$  to 2 ins. above the bulb covered with smooth closed leaf-sheaths, blades narrowly linear, gradually tapering to a slender acuminate apex, shorter than the flowering stem. Inflorescence sometimes with short primary rays arranged in an umbellate manner, most often with tufts of 2-3 sessile spikelets arranged as a spike. Spikelets linear about  $\frac{1}{2}$  in. long, chestnut-brown, the glumes continued down the internodes of the rachis as hyaline wings. Glumes elliptic when spread out,  $\frac{1}{8}$  in. long, obtuse. Stamens 2-3. Nut obovoid, trigonous, black, about half as long as the glume; style divided into 3 rather long branches nearly to the base.

Cawnpore (Duthie); Aligarh (Duthie); Agra. DISTRIB.: Central and S. India, Ceylon, tropical Asia, Africa and Australia.

2. PYCREUS, Beauv.; Fl. Brit. Ind. vi, 589.

Perennial or annual herbs, tufted or with decumbent stems or horizontally running rhizomes. Stem bases covered with leaf-sheaths many of which have no fully developed blades. The inflorescence consists usually of numerous spikelets arranged more or less in a simple or compound umbellate manner. The spikelets are each composed of numerous glumes arranged in 2 ranks on the rhachis. The lowest two glumes are usually empty and often somewhat different in shape and size from the upper (flowering) glumes. Each flower consists of 2 or 3 stamens and an ovary tipped by a bifid style. The nut is compressed laterally, the 2 sides being practically equal, both convex and placed right to left in relation to the rhachis of the spikelet. Species about 85 in most hot and temperate regions.

Glumes obtuse.

Stems erect, cæspitose; leaves arising near the base of the stems; nut elliptic in outline when viewed laterally . . . . . 1. *P. globosus*.

Stems often decumbent at base; leaves arising from the stems up to  $\frac{1}{3}$  of their length; nut broadly obovate in outline when viewed laterally . . . . . 2. *P. sanguinolentus*.

Glumes mucronate . . . . . 3. *P. pumilus*.

1. *P. globosus*, Reich. Fl. Germ. Excurs. 140-10 (1830-2). *P. capilaris*, Nees in Linnaea, IX, 283 (1834); F. B. I. vi, 591; Prain, Beng. Pl. 1137; Collett, Fl. Siml. 553. *Cyperus globosus*, All. Auct. Fl. Pedem. 49 (1789); Cooke Fl. Bomb. ii, 857.

A cæspitose, erect growing, glabrous plant up to 16 ins. high. Roots fibrous. Stem-bases covered with 1 or 2 brown sheathing cataphylls without blades or with short ones. Leaves all arising near the base of the stem; blades narrow linear, up to 6 ins. long but usually much shorter, slender almost filiform; sheaths about 1 in. long, closed, with a truncate mouth. Spikelets often numerous, arranged in a simple or compound nearly umbellate inflorescence, many-flowered,  $\frac{1}{4}$ - $\frac{3}{4}$  in. long,  $\frac{1}{8}$  in. broad; bracts 2-3, often very unequal,

up to 7 ins. in length. *Glumes* ovate, with a green keel, obtuse,  $\frac{1}{5}$  in. long, nearly  $\frac{1}{5}$  in. broad. *Stamens* 2. *Style* with arms  $\frac{1}{2}$  in. long. *Nut* ellipsoid when viewed laterally, strongly compressed,  $\frac{1}{5}$  in. long, pale brown in colour.

Moradabad (T. Thomson), Gonda (Harsukh), Shikohabad (Duthie), Pilibhit (Inayat), Dehra Dun (Duthie), Meerut (Duthie), Kheri (Inayat), Saharanpore.

There is a considerable variety in the size, shape and colour of the spikelets, but I have not been able to follow C. B. Clarke in limiting the varieties as he does in the Flora of British India. The variety *nilagiricus*, which I have not seen from our area but which probably occurs there, may usually be recognised by the dark colour of the spikelets. The variety *strictus*, to which Clarke has referred the Moradabad plant, appears to be connected with the type by all grades of intermediates. It is said to be characterised by having narrower, straw-coloured or yellow spikelets, less compressed, frequently short, 6-12-flowered, sometimes curved or twisted and the glumes closely packed but loosely imbricate.

DISTRIB.: Throughout India, Ceylon and most of the temperate and tropical regions of the old world.

2. *P. sanguinolentus*, Nees in *Linnæa* IX, 283; F. B. I. vi, 590; Prain, *Beng. Pl.* 1137; Cooke *Fl. Bomb.* ii, 856; Collett, *Fl. Siml.* 553.

An erect glabrous annual or perennial herb up to 14 ins. high. Roots fibrous and usually tufted. Rhizome very short or none or elongated and covered by brown leaf-sheaths, sometimes the stem is decumbent and roots at the nodes. Leaves all arising from the lower third of the stems, blades linear, up to  $3\frac{1}{2}$  ins. long, usually less, sheaths closed, with a truncate mouth. Spikelets 8 to 30 in an apparently simple to obviously compound head, each 10 to 20 flowered,  $\frac{1}{2}$  to  $\frac{2}{3}$  in. long, about  $\frac{1}{3}$  in. broad; bracts 3 to 4, unequal, leaf-like and up to  $3\frac{1}{2}$  ins. long. *Glumes* light brown, broadly boat-shaped, obtuse,  $\frac{1}{5}$  in. long,  $\frac{1}{5}$  in. wide when spread out, keel rounded below, sharp above, with three green nerves converging to the apex. *Stamens* 3. *Style* including arms  $\frac{1}{6}$  in. long. *Nut* broadly obovate in outline when viewed laterally in which plane it is strongly compressed, dark dull brown,  $\frac{1}{6}$  in. long and  $\frac{1}{25}$  in. diameter measured from front to back.

Dehra Dun (Duthie), Saharanpur (Parker). DISTRIB.: Throughout India and the warmer parts of the Old World.

3. *P. pumilus*, Turrill, in *Kew Bull.* 1922, p. 124; *Cyperus pumilus*. *L. Amaen. Acad.* iv. (1788) 302, et *Sp. Pl. ed.* 2, 69 et *herb. prop. Cyperus pulvinatus*, *Nees et Meyen* in *Wight Contrib.* (1834) 74; *Pycreus pulvinatus*, *Nees* in *Linnaea* IX (1834) 283; *Pycreus nitens*, *Nees*, *l. c. and C. B. Clarke* in *F. B. I.* vi, 591.

A small annual glabrous plant, 1-10 ins. high. Stems tufted often numerous, slender, bases covered with not fibrous, rather close-fitting often reddish sheaths. Leaves tapering to a fine acuminate apex, linear, variable in length,  $\frac{1}{10}$ - $\frac{1}{5}$  in. broad, with a prominent midrib. Inflorescence an umbel of spikes, primary rays up to 3 ins. long but usually much shorter, ending in spikes of 3 to 30 spikelets; primary bracts about 3, leaf-like, unequal, generally much over-topping the inflorescence and up to  $\frac{1}{4}$  in. long. Spikelets linear, compressed, 6 to 40 flowered, up to  $\frac{1}{2}$  in. long, about  $\frac{1}{10}$  in. broad, rachilla not winged. Lowest glumes empty, smaller; flowering glumes  $\frac{1}{5}$  to  $\frac{1}{2}$  in. broad, ovate in outline, keel herbaceous, well-marked, prolonged at the apex into a more or less prominent, slightly curved mucro, wings hyaline without nerves. Stamen generally 1. Nut  $\frac{1}{20}$  in. long, obovoid or ellipsoid, laterally compressed, brown; style slightly longer than the nut, divided into 2 arms to just below the middle.

Moradabad (Thomson); Dehra Dun (Gamble, Duthie); Saharanpur (Parker); Shahjahanpur (Duthie); Shikohabad (Duthie); Haldwani (Parker).

3. **JUNCELLUS**, C. B. Clarke; *Fl. Brit. Ind.* vi, 594.

Perennial erect herbs, tufted or with horizontally running rhizomes. Stems erect, simple and leafy below. The inflorescence is very varied and consists of usually many (sometimes reduced to 1) spikelets arranged in compact terminal or unilateral heads or more or less in compound umbellate manner or sometimes the primary and secondary branches are in umbels and the spikelets themselves in spikes. The spikelets are each composed of numerous glumes arranged in 2 ranks on the rachis. The lowest 2 glumes are usually empty and often different in shape and size and from the upper (flowering) ones. Each flower consists of 2 or 3 stamens and an ovary surrounded by a bifid or nearly entire style. The nut compressed back to front in relation to the axis, the adaxial side being flat, the abaxial more or less convex.

Species about 15 in most hot and temperate regions.

I have followed C. B. Clarke in retaining this genus although I do not consider it a phylogenetic unit but rather an agglomeration of species related to different groups of species in the genus *Cyperus*. Its characters, however, are definite and even if they are artificial accepting them as generic helps to make the large genus *Cyperus* less unwieldy.

Leaf-blades flat, with well developed, long, broad blades; inflorescence of numerous spikelets arranged in spikes which in turn form a compound umbel . . . . .

1. *J. alopecuroides*.

Leaf-blades narrow, flat or more or less trigonous; inflorescence a head of spikelets (rarely reduced to a solitary one).

Leaf-blades trigonous or subcylindrical often much reduced; inflorescence a one-sided head of spikelets or sometimes a solitary one . . . . .

2. *J. laevigatus*.

Leaf-blades flat and narrow, well developed; inflorescence a dense head of small spikelets surrounded by leaf-like bracts . . . . .

3. *J. pygmaeus*.

1. *J. alopecuroides*, C. B. Cl. in F. B. I. vi, 595; *Cyperus alopecuroides*, Rotib. *Descrip. et Icon.* (1773) 38.

An erect-growing, glabrous, marsh plant, about 25 ins. high. Roots forming a dense fibrous mass. Stems covered at the base with broad, brown leaf-sheaths. Leaves linear, gradually acuminate, up to  $\frac{1}{2}$  in. broad, with 3 prominent and many secondary parallel nerves, smooth; leaf-sheaths usually split down one side by the growing stem. Spikelets pale brown, ultimately in compact spikes 1-1 $\frac{1}{2}$  ins. long which are arranged in a compound inflorescence, primary and often secondary branches arranged in an umbellate manner, primary rays up to 5 ins. long; primary bracts 3, leaf-like and over-topping the inflorescence, more or less unequal in length; secondary bracts narrowly linear, sometimes much reduced. First glume empty, linear-lanceolate, acuminate. Second glume suborbicular, with a rounded apex. Flowering glumes boat-shaped with a rounded keel, suborbicular in outline when spread open, acute or slightly apiculate,  $\frac{1}{12}$  in. long and broad. Stamens 2. Style including the 2 long arms  $\frac{1}{12}$  in. long. Nut broadly obovate,  $\frac{1}{12}$  in. long, and  $\frac{1}{12}$  in. broad, flat on the adaxial side and slightly rounded on the abaxial.

Saharanpur (Royle), Moradabad (Thomson), Ajmer (Lowrie), Bundelkhand (Duthie). DISTRIB.: Most of India, Ceylon, Africa and Tropical Australia.

2. *J. lœvigatus*, *C. B. Cl. in F. B. I. vi*, 596. *Cyperus lœvigatus*, *L. Mant. 179*; *Cooke, Fl. Bomb. ii*, 860.

An erect-growing, glabrous plant up to 16 ins. high. Rhizome sometimes short when the plant has a cæpítose habit, sometimes horizontally extended and then covered with dark-brown sheathing, entire cataphylls. Stems usually arising 2-4 together from the rhizome, covered at the base with entirely closed leaf-sheaths which have truncate mouths and often undeveloped or only slightly developed blades, when these are present they are of various lengths and usually stiff and triangular or subcylindrical, acute or sub-acute. Spikelets up to 12 in a compact, one sided head, sometimes solitary, in our specimens up to nearly  $\frac{1}{2}$  in. long, often much shorter, about  $\frac{1}{10}$  in. broad, pale-straw coloured; bracts 2, with broad open sheathing bases, one about  $\frac{1}{2}$  in. long with a slightly developed blade, the other up to  $1\frac{1}{2}$  ins. long. Glumes broadly ovate with a rounded keel, acute, about  $\frac{1}{10}$  in. long and  $\frac{1}{5}$  in. broad. Stamens 3, anthers with an apiculus. Style  $\frac{1}{10}$  in. long, simple or slightly bifid at apex. Nut broadly ellipsoid in outline, flattened on the adaxial side, convex on the abaxial,  $\frac{1}{10}$  in. long, brown, smooth.

Saharanpur (Royle, 5, 59), Meerut (Thomson), Moradabad (Thomson), Gwalior (Maries), Merwara (Duthie), Bundelkhand (Duthie). DISTRIB.: Throughout Western India and in most warm regions.

3. *J. pygmæus*, *C. B. Cl. in F. B. I. vi*, 596; *Prain Beng. Pl. 1138*. *Cyperus pygmæus*, *Rottb. Descrip. et Icon. p. 29, t. 14, f. 5* (1773); *Cooke, Fl. Bomb. ii*, 859.

An erect annual plant with numerous stems close together in tufts up to 8 ins. high, but usually shorter. Each stem-base is covered by entire broad sheathing often reddish leaf-bases. Leaf-sheaths loose-fitting with oblique mouths, blades narrowly linear, acuminate, up to  $4\frac{1}{2}$  ins. long,  $\frac{1}{10}$  in. broad. Inflorescence a dense solitary terminal head  $\frac{1}{2}$  to  $\frac{1}{2}$  in. in diameter and composed of numerous spikelets surrounded by 3 to 5 long unequal bracts which are leaf-like but broader towards the base, more reduced very narrow bracts frequently arise from among the spikelets. Each spikelet about  $\frac{1}{2}$  in. long of about 18 glumes arranged in two ranks. Glumes  $\frac{1}{10}$  in. long, narrowly boat-shaped with rounded keels, acute or with a

thickened slightly acuminate apex. Stamens 1-2. Nut ellipsoid  $\frac{1}{2}$  in. in length, surmounted by a 2-armed style  $\frac{3}{5}$  in. long. Delhi (Royle), Agra (Jameson), Ajmer (Lowrie), Bundelkhand (Duthie), Etawa (Duthie), Moradabad (Thomson), Kheri (Inayat), Pilibhit (Inayat), Haldwani (Parker). DISTRIB.: Kashmir to Burma and Ceylon, and most warm regions except S. Europe. This plant is exceedingly like *Scirpus Michelianus*, Linn. but the flowers are distichous, in S. Michelianus the flowers are spirally arranged and the nut oblong or fusiform.

4. KYLLINGA, Rottb.; Fl. Brit. Ind. vi, 587.

Perennial erect herbs, tufted or with horizontally running rhizomes which are sometimes very slender and much branched. Each stem leafy below and terminated by 1 to 3 sessile heads forming spikes usually composed of numerous closely crowded spikelets. Each spike or group of spikes is accompanied by 3 or 4 or many usually unequal, leaf-like bracts. Spikelets spirally arranged, compressed laterally to the run of the spiral of 4 or 5 glumes arranged in 2 ranks. The lowest 2 glumes empty, relatively small, often hyaline and the disarticulation of the spikelet takes place above their insertion. The third glume contains a perfect flower of 1 to 3 stamens and an ovary. The fourth and fifth glumes are empty or the former may contain a male or rudimentary flower. The third and fourth glumes the largest of the spikelet, boat-shaped with usually a well-marked and sometimes winged and ciliated or serrulated keel. Nut laterally compressed and abruptly passes above into a style which has no swollen base and divides above into 2 linear arms. Species about 60, in all hot and temperate regions except Europe.

Plant tufted, with very short and not horizontally running rhizomes; older leaf-sheaths fibrous . . . . .

1. *K. triceps*.

Plant with elongated, generally slender, horizontally running rhizomes; leaf-sheaths not fibrous . . . . .

2. *K. brevifolia*.

Nut-bearing glume not winged on the upper part of the keel . . . . .

Nut bearing glume with a well-developed wing on the upper part of the keel . . . . .

3. *K. monocephala*.

1. *Kyllinga triceps*, Rottb. *Descr. et Ic.* 14, t. 4, fig. 6 (excl. cit. *Rheede*) ; *F. B. I.* vi, 587 ; *Prain, Beng. Pl.* 1135 ; *Cooke Fl. Bomb.* 877. *K. monocephala*, *Nees in Wight Contrib.* 91 (not of *Rottb.*).

A glabrous or nearly glabrous plant, caespitose in habit with no horizontally running rhizome. Stems 2-13 ins. high, covered at the base by the more or less fibrous leaf-sheaths. Leaves linear,  $\frac{1}{10}$  in. broad or less, about  $\frac{1}{2}$  the length of the stems or nearly as long as them. Bracts 3 or 4,  $\frac{1}{2}$  to 2 ins. long very similar to the leaves. Spikes ovoid-oblong, about  $\frac{1}{10}$  ins. long and  $\frac{1}{8}$  in. in diameter, usually 3 aggregated into a compact head, in which case the central spike is larger than the lateral ones. Spikelets with one fertile flower. Two lowest glumes empty, the outermost lanceolate, the other lanceolate-elliptic, each about  $\frac{1}{10}$  in. in length. Third glume boat shaped,  $\frac{1}{12}$  in. long with 3 ribs on each side of a well-marked, smooth keel, apiculate. Fourth glume more elongated,  $\frac{1}{12}$  in. long, more membranous and the ribs not so strongly marked. Stamens usually 2. Nut oblong or ellipsoid-oblong, laterally compressed, about  $\frac{1}{15}$  in. long ; style with the 2 filiform arms about  $\frac{1}{16}$  in. long.

Moradabad (Thomson), Dehra Dun (Duthie), Agra (Jameson), Gwalior (Maries), Udaipur. DISTRIB. : Throughout India, Burma, Ceylon and also in Tropical Africa and Tropical Australia.

2. *Kyllinga brevifolia*, Rottb. *Descr. et Ic.* 12, t. 4, fig. 3 ; *F. B. I.* vi, 588 ; *Prain, Beng. Pl.* 1135 ; *C. B. Clarke Ill. Cyp. t. I.* f. 1-4.

Quite glabrous, except the glume keels, generally with long, slender, horizontally running rhizomes which are covered with brown not fibrous, acute scale-leaves. Stems  $3\frac{1}{2}$  to 12 ins. high, covered towards the base with leaf-sheaths which are usually brown, shiny and not fibrous. Leaves linear, about  $\frac{1}{10}$  in. in breadth and generally shorter than the stem, acuminate. Bracts up to 2 to 4 ins. long, very similar to the leaves. Spikes oblong-cylindrical, about  $\frac{1}{10}$  in. long and  $\frac{1}{2}$  in. in diameter, usually simple. Spikelets lanceolate or ovate-lanceolate, about  $\frac{1}{8}$  in. in length, containing one flower. The lowest glumes empty and subequal, obtuse, about  $\frac{1}{12}$  in. long. Third glume boat-shaped acuminate,  $\frac{1}{10}$  in. long, 2 nerves on either side of the keel which is serrated. Fourth glume slightly larger, thinner in texture and with the nerves scarcely marked. Stamens 2. Nut obovate-ellipsoid, strongly compressed laterally, about  $\frac{1}{20}$  in. long ; style with two filiform arms, about  $\frac{1}{15}$  in. long.

Dehra Dun (Gamble), Saharanpur (Jameson), Moradabad (Thomson), Haldwani (Parker). *DISTRIB.* : Throughout India and Ceylon and in most tropical or subtropical regions.

3. *Kyllinga monocephala*, *Rotib. Descr. et Ic. 13*, *t. 4*, *fig. 4* ; *F. B. I. vi*, *588* ; *Prain, Beng. Pl. 1135* ; *Cooke, Fl. Bomb. ii*, *876* ; *C. B. Clarke Ill. Cyp. t. II*, *fig. 1-2*.

An erect glabrous plant (except the glume keels), with well-developed rhizomes either long and slender or shorter and stouter and covered with brown, persistent, not fibrous, scale leaves. Stems up to 12 ins. high, slender, covered with leaves only at the base ; leaf-sheaths pale brown not fibrous. Leaves linear,  $\frac{1}{16}$  to  $\frac{1}{8}$  in. in breadth and often as long as the stem, acuminate, rough on the midrib and margins. Bracts 3 to 4, unequal, up to 10 ins. long, similar to the leaves. Spikelets subglobose, about  $\frac{1}{4}$  in. in diameter, solitary. Spikelets obliquely lanceolate-elliptic,  $\frac{1}{8}$  in. long, containing one flower. The lowest glume hyaline with 3 to 5 nerves on each side of the midrib, about  $\frac{1}{50}$  in. long. The second glume similar but narrower and more acute. The third glume boat-shaped, acuminate, with 3 well-marked nerves on each side of the prominently winged keel which is slightly serrated. Fourth glume slightly narrower and more elongated and with a less prominent wing to the keel. Stamens 2-3. Nut obovate, very much compressed  $\frac{1}{16}$  in. long and  $\frac{1}{10}$  in. broad ; style flattened and relatively broad with short arms.

Dehra Dun (Duthie), Saharanpur, (Royle), Gonda, Haldwani (Parker), Bahraich (Duthie). *DISTRIB.* : Throughout India and Ceylon and widely spread in the warm and temperate regions of the Old World, except the Mediterranean.

##### 5. COURTOISIA, Nees. *Fl. Brit. Ind. vi*, 625.

Herbs with erect simple stems and grass-like leaves. Spikelets compressed in globose spikes, rachilla disarticulating above the two lowest glumes. Glumes the two lowest usually empty, 1-3 following bisexual, winged on the keel, the uppermost sterile. Stamens 3, anthers oblong. Style short persistent, stigmas 3, long. Nut trigonous, apex acute, continuous with the style. Species 2, India, Africa and Madagascar.

C. *cyperoides*, Nees, in *Linnaea* (1835) 286 ; *F. B. I. vi*, 625 ; *Prain, Beng. Pl. 1147* ; *Cooke, Fl. Bomb. ii*, 877.

Annual, glabrous, tufted, roots fibrous. Stems 2 in. to 2 ft. high, triquetrous, glabrous. Leaves  $\frac{1}{16}$ - $\frac{1}{8}$  in. broad, usually longer than

the stem, sheaths membranous, deeply split. *Umbels* simple or compound, rays 3-10, 1-3 in. long, secondary rays 3-6, up to 1 in. long, bearing dense globose yellowish-brown heads composed of many short spikelets; bracts 3 or more of different sizes the longest much exceeding the rays. Flowering glumes usually 2,  $\frac{1}{6}$  in. long, boat-shaped, keel prominently winged throughout its length, sides membranous, tip shortly cuspidate, usually only one glume nut-bearing. *Nut*  $\frac{1}{8}$  in. long, narrowly trigonous-fusiform, beaked, brown, embraced by the glumes.

Bundelkhand (Duthie). DISTRIB.: Tehri-Garhwal (Gamble!) Central Provinces (Lowrie and others!) Assam, Madras, Burma and Madagascar.

#### 6. MARISCUS, Vahl.; F. B. I. vi, 619.

Perennial glabrous erect herbs, generally similar to *Cyperus* in most of their characters. Inflorescence a solitary head of spikelets or more commonly, and in all our species, umbellate, the primary or secondary rays terminating in compact heads of narrow spikelets; bracts similar to the leaves. Glumes 4 to 14, in two opposite rows, persistent on the rachilla, the 2 or 3 lowest and the uppermost empty, the flowering glumes 1 to 10. The axis of the spikelet disarticulating and falling off in fruit just above the 2 lowest empty glumes which are left on the main rachis. Bristles absent. Style 3-branched and nut 3-sided. Species about 160, in all warm regions.

Inflorescence a compound umbel with the secondary rays terminating in globular heads of narrowly linear spikelets, each of which bears 4 to 10 nuts . . . . .

1. *M. dilutus*.

Inflorescence a simple umbel with rays terminating in cylindrical heads of spikelets, each of which bears 1 to 2 nuts . . . . .

Rhizome not producing stolons. Spikelets each bearing 2 nuts . . . . .

2. *M. cyperinus*.

Rhizome producing stolons. Spikelets each bearing 1 nut . . . . .

3. *M. paniceus*.

1. *M. dilutus*, Nees in *Wight Contrib.* (1834) 90. *Cyperus dilutus*, Vahl. *Enum.* v. 2 (1806) 357; Cooke, *Fl. Bomb.* 2, 875.

*Mariscus microcephalus*, *Presl. Rel. Hænk.* i, 182; *F. B. I. vi*, 624; *Prain, Beng. Pl.* 1147.

An erect perennial glabrous herb. Rhizome short. Stem 1-4 ft. high, obscurely trigonous, smooth, longitudinally striated. Leaves variable, tapering to an acuminate apex, generally about as long as linear,  $\frac{1}{2}$  to  $\frac{1}{4}$  in. broad, frequently somewhat spongy, margins and keels more or less scabrid; sheaths broad, reddish-brown, not fibrous. Primary umbel large with numerous rays of various lengths up to 7 ins.; secondary umbels similar but the rays shorter and ending in compact sphæroidal spikes about  $\frac{3}{4}$  in. diameter and composed of numerous slender spikelets; primary bracts numerous, leaf-like but generally shorter and less spongy. Spikelets narrowly linear,  $\frac{1}{2}$  to  $\frac{1}{4}$  in. long, terete, red-brown, bearing 2 to 10 nuts; rachilla slender provided with hyaline wings by the decurrent glumes, oblong lanceolate or elliptic, obtuse,  $\frac{1}{2}$  in. long,  $\frac{1}{10}$  in. broad, with faint longitudinal striations, keel rounded. Stamens 3. Nut narrowly oblong in outline, trigonous, narrowed above into an acute beak,  $\frac{1}{10}$  in. long; style with its 3 branches  $\frac{1}{5}$  in. long.

Dehra Dun (Gamble), Moradabad (Thomson), Saharanpur, Shahjahanpur (Duthie), Haldwani (Parker). DISTRIB.: Throughout most of India and Tropical Africa.

2. *M. cyperinus*, *Vahl. Enum. ii*, 377; *F. B. I. vi*, 621; *Collett, Fl. Siml.* 558.

An erect glabrous herb. Rhizome short, not producing stolons, covered with more or less fibrous sheaths. Stems about 1-2 ft. high, longitudinally striated, trigonous. Leaves linear tapering to an acute or acuminate apex, generally about as long as the stem, up to  $\frac{1}{2}$  in. broad, margins and keel smooth or slightly scabrid, sheaths reddish, the lowermost fibrous. Umbel terminal, simple, composed of 6-12 rays of different lengths up to 2 ins. and terminating in dense cylindrical spikes up to 1 in. long but generally shorter and about  $\frac{1}{2}$  in. diam.; bracts leaf-like but often broader and more scabrid. Spikelets numerous,  $\frac{1}{2}$  in. long, each ripening 2 nuts. The two lowest glumes short, nearly  $\frac{1}{2}$  in. long, each with 3 strong nerves, sides spread out, obtuse, nearly  $\frac{1}{2}$  in. long, keel with 3 strong nerves, sides with reddish brown dots, and scarcely hyaline margins; the fifth glume very much reduced and empty. Stamens 3. Nut oblong-ellipsoid, slightly curved, trigonous,  $\frac{1}{5}$  in. long; style with the three stigmatic branches about as long as the nut.

Moradabad (Thomson). DISTRIB.: N. W. India, Coromandel, Ceylon, Malay Peninsula and Trop. Asia and Polynesia; in Assam and Sikkim represented by the variety *bengalensis*, C. B. Cl.

3. *M. paniceus*, Vahl. var. *Roxburghianus*, C. B. Cl.; *F. B. I.*, vi, 621; *Cooke, Fl. Bomb. ii*, 875.

An erect perennial glabrous herb. Rhizome short, more or less horizontal, covered with fibrous leaf-sheaths and giving rise to slender somewhat rigid stolons. Stem up to 2 ft. high, smooth, trigonous, frequently thickened into nodules at the base where it passes into the rhizome. Leaves generally shorter than the stem, up to  $\frac{1}{2}$  in. broad; sheaths of the stem-leaves not fibrous, generally reddish. Umbel terminal, simple, composed of 6 to 21 rays of different lengths, up to 3 ins. and terminating in dense cylindrical spikes up to 1 in. long, but generally shorter, and  $\frac{1}{2}$  in. diam.; bracts leaf-like but often broader and more scabrid. Spikelets numerous,  $\frac{1}{8}$  in. long, each ripening 1 nut. The two lowest glumes empty, short; the third glume nut-bearing, elliptical-lanceolate when spread out, nearly  $\frac{1}{8}$  in. long, keel with 3 strong nerves, sides often with reddish-brown dots and hyaline margins; the fourth glume very much reduced and empty. Stamens 3. Nut oblong-ellipsoid, slightly curved, trigonous,  $\frac{1}{12}$  -  $\frac{1}{10}$  in. long, pale brown; style with the 3 stigmatic branches about as long as the nut.

Dehra Dun (Duthie, etc.), Saharanpur, Bahraich (Harsukh), Siwalik Range (Lowrie). Throughout most of India; Ceylon, Java.

7. **HELEOCHARIS**, R. Br.; *Fl. Brit. Ind.* vi, 625 (*Eleocharis*).

Stems simple, tufted erect. Leaves wanting, sheaths few cylindric, truncate or with a small unilateral subapical tooth, non-flowering leaflike stems often present. Inflorescence a solitary (rarely more) ovoid or cylindric terminal spikelet. Glumes imbricate on all sides of the rachilla, the lowest usually empty, bract-like, shorter than the spikelet. The lowest and several succeeding flowers bisexual, the upper imperfect. Hypogynous bristles 8-5 rarely fewer or 0. Stamens 1-3. Style base dilated, usually sharply constricted and apparently articulated on the nut but persistent. Nut obovoid, plano-convex when the style is bifid, trigonous when the style is trifid. Species over 100, cosmopolitan.

Spikelets distinctly wider than the stems.

Spikelets  $\frac{1}{10}$ - $\frac{1}{5}$  in. long, nut minute tipped by the minute style base . . . . .

1. *H. atropurpurea*.

Spikelets  $\frac{1}{5}$ -1 in. long, nut  $\frac{1}{10}$  in. long, style base almost half as long as the nut . . . . .

2. *H. palustris*.

Spikelets scarcely wider than the stem, glumes with narrow scarious margins . . . . .

3. *H. plantaginea*.

1. *H. atropurpurea*, Kunth, *Enum. ii* (1837) 151; *F. B. I. vi*, 627; *Prain, Beng. Pl. 1149*; *Cooke, Fl. Bomb. ii*, 889.

Annual, stems 2-6 in. high, very slender, tufted, sheaths short, membranous. Spikelets  $\frac{1}{10}$ - $\frac{1}{5}$  in. long, ovoid, much broader than the stem, rachilla slender, pitted. Glumes  $\frac{7}{10}$ - $\frac{1}{5}$  in. long, broadly ovate-oblong, obtuse, keel green, margins broad membranous dark colored. Bristles 4-7 as long as the nut, white, often wanting or very small. Nut minute  $\frac{1}{10}$ - $\frac{1}{5}$  in. long, black, polished, obovoid, biconvex, tipped with the pale disciform style-base, style 2-fid.

Dehra Dun (Parker) common in drying up rice fields. Moradabad (Thomson), Shahjahanpur (Duthie). DISTRIB.: most tropical countries.

2. *H. palustris*, R. Br. *Prodr. Fl. Nov. Holl.* (1810) 224 in obs.; *F. B. I. vi*, 628; *Prain, Beng. Pl. 1149*; *Cooke, Fl. Bomb. ii*, 890; *Collett Fl. Siml.* 559.

Stems 4-20 in. high  $\frac{1}{10}$ - $\frac{1}{5}$  in. diam. tufted, longitudinally striate, sheaths membranous, truncate or sometimes produced as a small triangular limb. Spikelets  $\frac{1}{5}$ -1 in. long, ellipsoid or cylindric, yellow or brown, wider than the stem, supported at the base by a bract continuous with the top of the stem and half-surrounding it, margin of the bract broad, scarious, rachilla stout. Glumes much imbricate, about  $\frac{3}{5}$  in. long, ovate-lanceolate or elliptic, keel green margins broad hyaline or brown. Bristles 4-6, as long as the nut, brown, retrorsely scabrid. Nut  $\frac{1}{10}$  in. long, broadly obovoid, biconvex, pale brown, tipped by the broadly conical style-base which is nearly half as long as the nut, style long, stigmas 2.

Saharanpur (Jameson), Aligarh (Duthie, Jameson), Kheri (Inayat). DISTRIB.: Cosmopolitan except Australia.

3. *H. plantaginea*, R. Br. *Prodr. Fl. Nov. Holl.* (1810) 224 in obs.; *F. B. I. vi*, 625; *Prain, Beng. Pl. 1148*; *Cooke, Fl. Bomb. ii*, 888.

Stems rush-like, 1-3 ft. high, terete, densely tufted,  $\frac{1}{16}$  in. diam. or rather more (up to  $\frac{1}{4}$  in. when dried and pressed flat) longitudinally striate and distantly transversely septate when dry, sheaths membranous, soon torn and somewhat fibrous. Spikelets  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, about the same diameter as the stem, pale straw color, supported at the base by an amplexicaul bract appearing continuous with the stem, rachilla stout angled. Glumes closely imbricate,  $\frac{1}{4}$  in. long, persistent, oblong, obtuse with a narrow scarious margin, back striate, keel not prominent. Eustachys 7, about as long as the nut, retrorsely scabrid. Nut  $\frac{1}{16}$  in. long, light yellowish-brown, tipped by the persistent conical style base which is about  $\frac{2}{3}$  as long as the nut, style very long, stigmas 2-3.

Moradabad (Thomson). DISTRIB.: tropics of the old world.

**3. FIMBRISTYLIS, Vahl; Fl. Brit. Ind. vi, 630.**

Annual or perennial tufted herbs, roots fibrous or woody, stolons. O. Leaves near the base of the stem. Inflorescence terminal, umbellate or corymbose or of few or one spikelet. Glumes spirally imbricate or the lower distichous or subdistichous, the lower 1-3 and sometimes the upper empty, hypogynous bristles O. Stamens 1-3, filaments flattened. Style long, usually flattened and more or less villous on the edges, base dilated, 2 or 3 fid. Nut obovoid, biconvex or trigonous, with a more or less inconspicuous gynophore. Species about 125 in all warm regions.

Stigmas 2, nut biconvex.

Spikelets solitary or 2-3.

Glumes glabrous.

Spikelets  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, glumes  $\frac{1}{8}$  in. long,  
nut  $\frac{1}{16}$  in. long . . . . .

1. *F. schoenoides*.

Spikelets  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, glumes  $\frac{1}{16}$  in.  
long, nut  $\frac{1}{32}$  in. long . . . . .

2. *F. diphyllo* var.

*annua*.

3. *F. ferruginea*.

Glumes hoary . . . . .

Spikelets numerous . . . . .

Glumes glabrous.

Nut with a minute gynophore or with  
none.

Spikelets not exceeding  $\frac{1}{4}$  in. nut not  
exceeding  $\frac{1}{32}$  in.

Spikelets not squarrose, style base  
glabrous.

Leaves often as long as the stem,  
not coriaceous.

Glumes  $\frac{1}{10}$  in. long, concave,  
nut  $\frac{1}{20}$  in. long . . . . . 2. *F. diphylla*.

Glumes  $\frac{1}{10}$  in. long, boat-  
shaped, nut  $\frac{1}{10}$  in. long . . . . . 3. *F. dichotoma*.

Leaves always short, coriaceous . . . . . 4. *F. spathacea*.

Spikelets squarrose, style base with  
long pendent hairs . . . . . 5. *F. squarrosa*.

Spikelets  $\frac{1}{2}$ - $\frac{1}{2}$  in. nut  $\frac{1}{15}$  in. long . . . . . 6. *F. rigidula*.

Nut with a distinct gynophore . . . . . 7. *F. podocarpa*.

Glumes puberulous . . . . . 8. *F. fuscinux*.

Tips of glumes spreading, nut black . . . . . 9. *F. ferruginea*.

Tips of glumes incurved, nut brownish . . . . .

Stigmas 3, nut trigonous . . . . . 10. *F. monostachya*.

Spikelets solitary . . . . .

Spikelets several to numerous.

Spikelets discrete.

Annuals, stems not flattened upwards.

Lower glumes distichous, nut  $\frac{1}{20}$  in.  
long . . . . . 11. *F. tenera*.

Glumes all spirally imbricate, nut  $\frac{1}{15}$   
in. long . . . . .

Spikelets ellipsoid, subacute, glumes  
 $\frac{1}{15}$  in. long . . . . . 12. *F. quinquangularis*.

Spikelets subglobose, obtuse, glumes  
 $\frac{1}{20}$  in. long . . . . . 13. *F. miliacea*.

Perennial, stems flattened upwards . . . . . 14. *F. complanata*.

Spikelets or some of them in clusters of  
2-5 . . . . . 15. *F. junciformis*.

1. *F. schœnoides*, Vahl, *Enum*, ii (1806) 286; *F. B. I. vi*, 634;  
*Prain Beng. Pl.* 1153; *Cooke Fl. Bomb. ii*, 880; *Collett, Fl. Siml.*  
560.

Tufted 3-12 in. high, glabrous, stems slender, striate, leaves very narrow almost filiform, sheaths with membranous margins. Spikelets usually solitary, sometimes 2 or 3,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, ovoid, bracts (empty glumes) usually similar to the flowering glumes, occasionally leaf-like and exceeding the spikelets. Glumes  $\frac{1}{8}$  in. long, suborbicular, shortly mucronate, keeled, many-nerved, very concave, straw-colored or pale brown, deciduous. Rachilla after the fall of the glumes ragged with minute scales. Style long flattened, hairy on the edges in the upper half. Nut  $\frac{1}{12}$  in. long, biconvex, compressed, obovoid, stipitate, shining, pale straw color or whitish.

Dehra Dun (Duthie, Gamble), Saharanpur (Royle), Cawnpore (Duthie)  
DISTRIB.: S. E. Asia, N. Australia.

2. *F. diphylla*, Vahl, *Enum. ii* (1806) 289; *F. B. I. vi*, 636; Prain, *Beng. Pl. 1153*; Cooke, *Fl. Bomb. ii*, 882; Collett, *Fl. Siml. 561*.

Tufted, 2-24 in. high, stems striate, leaves often as long as the stems up to  $\frac{1}{8}$  in. wide, scabrid on the margins towards the apex, sheaths glabrous or more or less villous, margins membranous. Spikelets in simple or compound umbels, ovoid  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, primary bracts leaflike exceeding the inflorescence or not. Glumes  $\frac{1}{16}$  in. long closely imbricate, concave, glabrous, broadly ovate, keel green 3-nerved, excurrent as a small mucro, margins smooth, brown or reddish. Rachilla after the fall of the glumes ragged from the scaly edges of the areoles. Style flattened, broad, villous on the edges. Nut  $\frac{1}{20}$  in. long, pale straw-colored or nearly white, glistening, biconvex 5-6 ribbed on each face, with elegant crosslines between the ribs.

Dehra Dun (Duthie, etc.). A common rainy season weed. Saharanpur, Filibhit, Cawnpore (Duthie), Gonda. DISTRIB.: all warm regions.

var. *ANNUA*, Clarke (*sp. Ræm. & Sch.*). A dwarf form about 2 in. high. Spikelets reduced to 1-3 or a few.

Dehra Dun (Duthie 6815, 7662).

3. *F. dichotoma*, Vahl, *Enum. ii* (1806) 287; *F. B. I. vi*, 635; Prain, *Beng. Pl. 1153*; Cooke, *Fl. Bomb. ii*, 880; Collett, *Fl. Siml. 561*.

Tufted, 2-20 in. high, stems striate, sometimes very slender, leaves as long as the stems or shorter, up to  $\frac{1}{8}$  in. broad, scabria on the margins

towards the apex, sheaths more or less villous or glabrous, margins membranous. *Spikelets* in compound or decomound umbels, ellipsoid or subcylindric  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, primary bracts leaf-like usually much exceeding the inflorescence. *Glumes*  $\frac{1}{20}$  in. long, closely imbricate, boat-shaped, keel green 1-3-nerved, prominent and excurrent as a small mucro, margins membranous, pale brown. *Rachilla* after the fall of the glumes deeply pitted. *Style* flattened, villous in the upper half. *Nut*  $\frac{1}{16}$  in. long, pale brown, biconvex, 5-9-ribbed.

Saharanpur (Royle, Jameson), Delhi (Royle), Agra (Jameson), Merwara (Lowrie), Etawah (Duthie), Pilibhit (Inayat), Kheri (Inayat), Gorakhpur (Harsukh). *DISTRIB.*: Warm regions of the old world.

*F. festialis*, Vahl. A very similar plant but more pubescent and with a smooth nut possibly occurs but the specimens are too young for satisfactory identification.

*4. F. spathacea*, Roth, *Nov. Pl. Sp.* (1821) 24; *F. B. I. vi*, 640; *Cooke, Fl. Bomb. ii*, 882.

Perennial, rhizome woody, stems 6-18 in. long, stiff, striate, leaves many near the base of the stem and up to  $\frac{1}{3}$  its length, coriaceous, narrow, scabrid on the recurved margins, sheaths glabrous, margins not hyaline. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, ovoid in simple or compound umbels which are often congested or subcapitate, bracts nearly as long as the rays, leaf-like, rigid with broad bases. *Glumes*  $\frac{1}{16}$  in. long, boat-shaped, obtuse, with a small obtusely triangular auricle on either side a little below the middle (caused by a portion of the glume breaking away and remaining attached to the rachillum), keel distinct, 1-2 additional pairs of rather obscure nerves, white and hyaline except for red streaks near the keel. *Rachilla* after fall of the glumes very ragged with prominent scales. *Style* glabrous, not flattened, conspicuously swollen at the base. *Nut*  $\frac{1}{30}$  in. long, minutely stipitate, biconvex, broadly obovate, obtuse, brown at first then dark grey or almost black, microscopically rugose.

Merwara (Duthie 4920). *DISTRIB.*: Orissa, S. India, Ceylon, Arabia, Malaya, etc.

*5. F. squarrosa*, Vahl, *Enum. ii* (1806) 289; *F. B. I. vi*, 635; *Prain, Beng. Pl.* 1153; *Collett, Fl. Siml.* 560.

Annual, tufted, more or less pubescent or glabrous, stems 2-8 in. high, slender, striate, leaves narrow, about half the length of the stem, sheaths densely pubescent. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, squarrose from the prominent tips of the glumes, in umbels consisting of a sessile

spikelet, several spikelets on pedicels of various lengths and a few rays the latter bearing a sessile spikelet and 1-3 pedicelled spikelets, bracts several, leaf-like the longest exceeding the rays. *Glumes*  $\frac{1}{2}$  in. long including the awn, blade broadly oblong, pale brown, keel excurrent as a curved awn about as long as the blade. *Rachilla* after the fall of the glumes rather slender, not deeply pitted. *Style* slender minutely hairy below the bifurcation, base slightly swollen and bearing many silky hairs which hang down over the nut and are  $\frac{1}{2}$ - $\frac{2}{3}$  of its length. *Nut*  $\frac{1}{2}$  in. long, obovoid, compressed, smooth minutely stipitate, straw-colored.

Moradabad (Thomson). DISTRIB. Northern India from Kashmir to Assam and Burma and all warm regions.

6. *F. rigidula*, Nees in *Wight Contrib.* (1834) 99; *F. B. I.* vi, 640; *Prain, Beng. Pl.* 1153; *Collett, Fl. Siml.* 561.

Perennial, stems bulbously thickened at the base clothed with the bases of the leaf-sheaths which tend to break up into separate fibres, flowering stems 6-18 in. high, striate, leaves half the length of the stem or much shorter, up to  $\frac{1}{2}$  in. wide, not narrowing upwards slightly scabrid on the margins, sheaths glabrous or nearly so with broad membranous margins. *Spikelets* in simple or somewhat compound umbels  $\frac{1}{2}$ -1 in. long, ellipsoid or subcylindric, bracts usually very much shorter than the rays sometimes almost as long. *Glumes*  $\frac{1}{2}$  in. long, concave, broadly ovate, dark brown in the upper half, keel not prominent slightly excurrent in the lower glumes. *Rachilla* after the fall of the glumes somewhat rough and pitted. *Style* hairy on the edges in the upper portion. *Nut*  $\frac{1}{2}$  in. long, brown or grey, biconvex, broadly obovate-obtuse in outline, minutely stipitate, very obscurely apiculate, minutely lacunose and reticulate.

Saharanpur (Royle) Kheri (Inayat). DISTRIB. Himalaya ascending to 6,000 ft. from Simla eastward and neighbouring plains, East Asia.

7. *F. podocarpa*, Nees in *Wight Contrib.* (1834) 98 (*ex parte*); *F. B. I.* vi, 638; *Prain, Beng. Pl.* 1152.

Tufted 8-16 in. high, stems striate, slender, leaves about half as long as the stems,  $\frac{1}{2}$ - $\frac{1}{3}$  in. wide, scabrid on the margins, sheaths more or less hairy with narrow membranous margins. *Spikelets* in simple or compound umbels, the umbel or branches of compound umbels with usually 3-5 spikelets,  $\frac{1}{2}$  in. long, ovoid, primary bracts leaf-like exceeding the inflorescence. *Glumes*  $\frac{1}{2}$  in. long, boat-shaped,

keel a narrow sharp ridge excurrent as a small cusp, margins brown. *Rachilla* after the fall of the glumes marked with large shallow areoles the margins of which project as scales especially at the base of the areole. *Style* flattened, ciliate above the base. *Nut*  $\frac{1}{16}$  in. long, pale straw-color, polished, biconvex, broadly elliptic in outline, margin thickened, faces with many fine longitudinal striae, gynophore obpyramidal  $\frac{1}{50}$  in. long.

Saharanpur (Royle). This species has not recently been collected in N. W. India. I have only seen three gatherings all of Royle.

DISTRIB. West Himalaya from the Simla district (Royle) to Assam, Chota Nagpur, Malaya, China.

8. *F. fuscinux*, *C. B. Clarke in Fl. Brit. Ind. vi* (1893), p. 638; *Prain, Beng. Pl. 1154*.

Tufted, stems rigid, striate, 8-20 in. high, leaves  $\frac{1}{2}$ - $\frac{3}{4}$  the length of the stem, rigid, coriaceous, tip obtuse, sheaths glabrous, brown, fibrous when old. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, narrowly ovoid, somewhat angular owing to the keeled glumes, in large compound umbels consisting of several rays and many pedicelled spikelets, bracts leaf-like with dilated bases. *Glumes*  $\frac{1}{16}$  in. long, broadly ovate, boat-shaped, acute, mucronate, keel 3-nerved, brown almost glabrous. *Rachilla* after the fall of the glumes rather stout with deeply pitted areoles. *Style* not flattened, glabrous. *Nut*  $\frac{1}{16}$  in. long, suborbicular in outline, biconvex, microscopically lacunose, dark brown, finally black.

Moradabad (Thomson) fide Clarke. DISTRIB. Sikkim Terai (Clarke !)

9. *F. ferruginea*, *Vahl, Enum. ii* (1806), 291; *F. B. I. vi*, 638; *Prain, Beng. Pl. 1154*; *Cooke, Fl. Bomb. ii*, 881.

Tufted 8-30 in. high, stems striate, leaves half as long as the stems or less, up to  $\frac{1}{2}$  in. wide, scabrid on the margins, sheaths more or less hairy with membranous margins. *Spikelets* in simple or sometimes compound umbels, usually 5-10 sometimes reduced to 1 or 3,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, ellipsoid or subcylindric, bracts usually shorter than the inflorescence. *Glumes*  $\frac{1}{16}$  in. long, broadly ovate, concave, keel not prominent slightly excurrent, hoary in the upper half, brown. *Rachilla* after fall of the glumes rough from the ragged edges of the areoles. *Style* broad flattened hairy on the edges in the upper half. *Nut*  $\frac{1}{16}$  in. long, pale brown, biconvex, suborbicular in outline, minutely stipitate and apiculate, microscopically multistriate.

Saharanpur (Gollan), Merwara (Duthie 4916). DISTRIB. Throughout the warmer parts of India, S. E. Asia, Australia.

**10. *F. monostachya*, Hassk. *Pl. Jav. Rar.* (1848), 61; *F. B. I.* vi, 649; *Prain, Beng. Pl.* 1152; *Cooke, Fl. Bomb.* ii, 885; *Collett, Fl. Siml.* 563.**

Densely tufted, stems thickened at the base, 3-16 in. high, slender or filiform, striate, leaves about half as long as the stem or more, almost filiform, sheaths smooth with membranous margins. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, ovoid, acute, solitary supported at the base by a bract which is usually leaf-like, shorter than the spikelet, hispid on the margins and with a small dilated base, sometimes the bract is more glume-like, this is followed by 2 or 3 bracts or empty glumes which become progressively more glume-like. *Glumes* sub-distichous  $\frac{1}{2}$  in. long, ovate, boat-shaped, strongly keeled, cuspidate, coriaceous, straw-colored. *Rachilla* after the fall of the glumes with conspicuous red-dotted scales (the margins of the glumes on either side being persistent). *Style* broad, flattened, hairy on the edge, base large, conical. *Nut*  $\frac{1}{16}$  in. long, pear-shaped, trigonous, minutely tubercled except on the narrowed base and short pyramidal apex, pale straw-colored.

Saharanpur. *DISTRIB.* Throughout the warmer parts of India and most warm countries.

**11. *F. tenera*, Rœm. & Schult. *Syst. ii, Mant.* (1824), 57; *F. B. I.* vi, 642; *Prain, Beng. Pl.* 1154.**

Annual tufted stems slender 6-12 in. high, leaves up to half the length of the stem  $\frac{1}{10}$  in. wide, glabrous, often very much reduced, sheaths glabrous, rather thin with hyaline margins. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long narrowly ovoid or subcylindric in lax subcompound umbels consisting of a sessile spikelet, 2 or 3 spikelets on pedicels of various lengths and 2 or 3 rays which usually bear one sessile and one or two pedicelled spikelets, bracts leaf-like with dilated bases, shorter than the rays. *Glumes*  $\frac{1}{12}$  in. long broadly ovate, acuminate, with an auricle on either side, somewhat boat-shaped, 3-nerved the keel prominent, slightly excurrent, brown, margin hyaline. *Rachilla* after the fall of the glumes rather stout, the areoles large depressed with prominent margins. *Style* glabrous, base swollen, stigmas 3. *Nut*  $\frac{1}{15}$  in. long trigonous-ovoid, dirty white, minutely verrucose.

Dehra Dun (Brown) Pilibhit, Shikohabad (Duthie 6510), Agra (Jameson). *DISTRIB.*: Punjab to Bengal and Madras (var. *oxylepis*, Clarke). Other varieties in Tropical Africa and Malaya.

12. *F. quinquangularis* Kunth. *Enum.* ii (1837), 229; *F. B. I.* vi, 644; *Prain, Beng. Pl.* 1154; *Cooke, Fl. Bomb.* ii, 883; *Collett, Fl. Siml.* 561.

Annual tufted, stems 1-2 ft. high, angular, striate, leaves longer or shorter than the stem, up to  $\frac{1}{10}$  in. wide, scabrid on the margins and midrib beneath, sheaths glabrous with broad membranous margins. Spikelets  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, ellipsoid or narrowly ovoid, subacute, very numerous in decompound umbels, rays very slender, pedicels filiform, bracts very narrow, leaf-like, shorter than the umbel. Glumes  $\frac{1}{10}$  in. long, ovate, somewhat boat-shaped, keel 3-nerved, slightly excurrent, margins brown, hyaline. Rachilla after the fall of the glumes ragged with small black scales. Style slightly villous below the 3 stigmas, not much dilated at the base. Nut  $\frac{1}{10}$  in. long, globosely obovoid, pale brown or whitish, minutely tuberculate.

Dehra Dun (Royle, etc.), Saharanpur, Agra (Jameson), Shikohabad (Duthie), Shahjahanpur (Duthie). *DISTRIB.*: Throughout India, Ceylon, China, Malaya, Australia.

13. *F. miliacea* Vahl, *Enum.* ii (1806), 287; *F. B. I.* vi, 644; *Prain, Beng. Pl.* 1155; *Cooke, Fl. Bomb.* ii, 883.

Annual tufted, stems 1-2 ft. high, angular, striate, leaves usually about as long as or rather longer than the stem, up to  $\frac{1}{2}$  in. broad, scabrid on the margins towards the apex, sheaths glabrous, margins scarious. Spikelets  $\frac{1}{5}$ - $\frac{1}{10}$  in. long, subglobose, obtuse in decompound umbels, rays and pedicels filiform, bracts linear-filiform with broad dilated bases shorter than the rays. Glumes  $\frac{1}{10}$  in. long, ovate, obtuse, somewhat boat-shaped or concave, obscurely nerved, keel not or scarcely excurrent, margins brown, hyaline. Rachilla after the fall of the glumes deeply pitted, the edges of the areoles pale and very short. Style glabrous scarcely swollen at the base. Nut  $\frac{1}{10}$  in. long, obovoid, pale brown, minutely tuberculate.

Dehra Dun (Parker), Saharanpur (Royle), Moradabad (Thomson). Very similar to *F. quinquangularis* but readily separable by the difference in the rachilla after the fall of the glumes. *DISTRIB.*: Throughout India and most warm countries.

14. *F. complanata*, Link, *Hort. Berol.* i (1827), 292; *F. B. I.* vi, 646; *Prain, Beng. Pl.* 1155; *Cooke, Fl. Bomb.* ii, 885; *Collett, Fl. Siml.* 562.

Tufted, rhizome short, creeping, stems 8 in.—2 ft. high, flattened in the upper half and scabrid on the edges beneath the umbel, striate, leaves shorter than the stems  $\frac{1}{10}$ – $\frac{1}{8}$  in. wide, tip abruptly narrowed, scabrid-ciliate, sheaths smooth coriaceous with membranous margins. Spikelets  $\frac{1}{4}$  in. long, narrowly ellipsoid, acute, in compound or decompound umbels, rays flattened, bracts the biggest leaf-like appearing as a continuation of the stem as seen from behind, amplexicaul as seen from in front, shorter than the umbel, scabrid-ciliate, the others linear-subulate with broad bases. Glumes subdistichous  $\frac{1}{10}$  in. long or slightly less, ovate, acutely keeled the keel more or less excurrent, margins brown. Rachilla after the fall of the glumes pitted, rough with short ascending acute scales. Style slender glabrous with a short conical base. Nut  $\frac{1}{15}$  in. long, whitish, obovoid, obtusely trigonous, one face broader than the other two, faintly striate, obscurely tuberculate.

Dehra Dun (Parker) Haldwani (Parker). In Himalayan specimens the nut is  $\frac{1}{15}$  in. long, smooth, with sometimes one face larger than the other two. In C. P. and Orissa specimens the nut is  $\frac{1}{30}$  in. long and minutely tubercled. DISTRIB. Warm regions of the old world.

15. *F. junciformis*, Kunth. *Enum.* ii (1837), 239; *F. B. I.* vi, 647; *Prain, Beng. Pl.* 1155; *Cooke, Fl. Bomb.* ii, 886; *Collett, Fl. Siml.* 562.

Rhizome woody, horizontal, covered with the fibrous remains of the leaf sheaths, stems 6–16 in. high, angular, striate, leaves crowded at the base of the stem and usually much less than half its length,  $\frac{1}{10}$ – $\frac{1}{8}$  in. wide, abruptly pointed, scabrid on the margins, sheaths coriaceous with broad membranous margins. Spikelets  $\frac{1}{4}$ – $\frac{1}{3}$  in. long, some solitary others in clusters of 2–5, arranged in compound umbels, bracts several, leaf-like, much shorter than the rays. Glumes  $\frac{1}{8}$  in. long, ovate, boat-shaped, the lower glumes mucronate, sides brown, margins narrow scarious. Rachilla after the fall of the glumes rough, pitted. Style slender, pubescent below the 3 stigmas, base small conical. Nut  $\frac{1}{15}$  in. long, trigonous obovoid, pale straw-colored nearly smooth or verrucose.

Delhi (Jameson), Saharanpur (Royle), Moradabad (Thomson), Pilibhit (Inayat), Bahraich (Harsukh). Flowers June, July. DISTRIB. Throughout India, Madagascar, Philippines.

#### 9. BULBOSTYLIS, Kunth.; *Fl. Brit. Ind.* vi, 651.

Tufted annuals with fibrous roots. Stems slender leafy only at the base, sheaths usually finely hairy. Spikelets congested or

umbelled, occasionally reduced to one spikelet. *Glumes* spirally imbricate, 1-2 lowest empty. Hypogynous bristles 0. *Stamens* 1-3, usually 2. *Style* as long as the nut, linear, glabrous, base very small bulbiform leaving a minute button on the nut after falling, stigmas 3. *Nut* obovoid, obtuse, trigonous, scarcely stipitate, smooth. Species 70 in all warm regions.

*B. barbata*, Kunth. *Enum. ii* (1837), 208; *F. B. I. vi*, 651; *Prain*, *Beng. Pl.* 1157; *Collett*, *Fl. Siml.* 563. *Stenophyllus barbata*, Rottb. *Cooke*, *Fl. Bomb. ii*, 887.

Stems 2-10 in. high, very slender, striate, sheaths striate on the back, hyaline in front, mouth pilose with very slender hairs, blade filiform as long as or shorter than the stem. *Spikelets*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long 3-20 in dense heads at the top of the stems, bracts filiform, the longest often erect and about twice as long as the spikelets so that the head appears lateral. *Glumes*  $\frac{1}{2}$  in. long, boat-shaped, ovate, keel green, excurrent as a small mucro, margins hyaline, often minutely puberulous and ciliolate. *Rachilla* after the fall of the glumes winged and scaly. *Nut*  $\frac{1}{10}$  in. long, obovoid, pale brown or yellow, very minutely stipitate and tipped with a button no larger than the stipe.

Delhi (Jameson), Saharanpur (Royle), Moradabad (Thomson), Jaipur (Sadhu Singh), Ajmer (Lowrie), Bundelkhand (Duthie), Pilibhit. A plant of sandy soil. *DISTRIB.* Throughout India and all warm regions.

**10. SCIRPUS, Linn. (in ; part) ; Fl. Brit. Ind. vi, 653.**

Herbs of very various habit, glabrous or the inflorescence slightly hairy. *Inflorescence* terminal or lateral of one to many spikelets in clusters or umbels. *Glumes* spirally imbricate or rarely the lowest subdistichous, 1-2 lowest and the uppermost empty. Hypogynous bristles present or not, sometimes broad ovate. *Stamens* 1-3. *Style* 2-3-fid, glabrous, base linear or conic, continuous with the nut. *Nut* obovoid, trigonous or biconvex, smooth or nearly so. Species about 130; throughout the world.

Spikelets 1-many in simple clusters or heads  
(in *supinus* a cluster on a ray sometimes  
added).

Clusters lateral on the stem.

Bristles present.

Stem terete, style 2-fid . . . . . 1. *S. erectus*.

Stem triquetrous, style 3-fid . . . . . 2. *S. mucronatus*.

Bristles 0.

Glumes  $\frac{1}{5}$  in. long or longer.

Glumes acute, not or scarcely keeled 3. *S. articulatus*.

Glumes mucronate, keeled.

Glumes smooth, nut  $\frac{1}{15}$  in. long . . . . . 4. *S. supinus*.

Glumes multistriate, nut  $\frac{1}{15}$  in. long . . . . . 5. *S. Roylei*.

Glumes  $\frac{1}{6}$  in. long with a cusp of the same length . . . . . 6. *S. squarrosus*.

Clusters terminal.

Perennial, style 3-fid . . . . . 7. *S. kyllingoides*.

Annual, style 2-fid . . . . . 8. *S. Michelianus*.

Spikelets many stalked or umbellated (sometimes reduced in *litoralis* and *maritimus*).

Umbels lateral, the lowest bract erect appearing as a continuation of the stem but sometimes short.

Bristles soft, linear, plumose . . . . . 9. *S. litoralis*.

Bristles harsh, retroflexly scabrid . . . . . 10. *S. lacustris*.

Umbels terminal, bracts leafy.

Umbels not decompound, spikelets few or many, rather large . . . . . 11. *S. maritimus*.

Umbels decompound, spikelets very numerous and small . . . . . 12. *S. chinensis*.

1. *S. erectus*, Poir, *Encyc. vi* (1804), 761; *F. B. I. vi*, 656; *Prain, Beng. Pl.* 1160.

Roots fibrous. Stems 4-15 in. high, terete, tufted, sheaths with an oblique mouth, sometimes produced in a short erect blade. Spikelets 1-3 in a single lateral head near the apex of the stem.  $\frac{1}{2}$ - $\frac{1}{3}$  in. long. Glumes 1 in. long, broadly ovate, acute, concave, keel not very prominent. Bristles 5-6, retroflexly scabrid (rarely 0, C. B. Clarke). Style usually 2-fid. Nut  $\frac{1}{12}$  in. long, plano-convex, broadly obovoid, apiculate, slightly transversely undulate, straw-colored, brown, ashy-grey, finally usually nearly black.

Dehra Dun (Parker) Bahraich (Inayat)... A weed of rice fields.  
DISTRIB. Throughout India, temperate Asia, N. America, Australia.

2. *S. mucronatus*, Linn. *Sp. Pl.* (1753), 50; *F. B. I. vi*, 657; *Prain, Beng. Pl.* 1161; *Collett, Fl. Siml.* 564.

Perennial, roots fibrous, rhizome short, horizontal. *Stems* 8-30 in. high, tufted, sharply triquetrous,  $\frac{1}{10}$ - $\frac{1}{4}$  in. thick, sheaths loose, membranous, mouth oblique. *Spikelets*  $\frac{1}{8}$ - $\frac{1}{4}$  in. long in a single lateral cluster of 1-12 close below the top of the stem. *Glumes*  $\frac{1}{8}$  in. long, broadly ovate, acute, keeled, finely multistriate. *Bristles* 5-6, retrorsely scabrid. *Style* 3-fid. *Nut*  $\frac{1}{12}$  in. long, broadly obovate in outline, apiculate, unequally trigonous or biconvex, dark brown, shining, nearly smooth.

Dehra Dun (Parker), Saharanpur (Royle), Agra (Jameson), Pilibhit, Kheri (Inayat), Gonda (Harsukh), Gorakhpur (Harsukh). *DISTRIB.* Northern India, Europe, Australia, Madagascar.

3. *S. articulatus*, *Linn. Sp. Pl.* (1753), 47; *F. B. I. vi*, 656; *Prain, Beng. Pl.* 1160; *Cooke, Fl. Bomb. ii*, 891.

Roots fibrous. *Stems* 6-24 in. high, terete, tufted, when dried and pressed flat  $\frac{1}{10}$ - $\frac{1}{4}$  in. wide, septate, sheaths loose, membranous, very oblique at the mouth, the apex sometimes free from the stem for about 1 in. but with no blade. *Spikelets*  $\frac{1}{8}$ - $\frac{1}{2}$  in. long, brown, in a single dense lateral head situated below the middle of the stem and often close to the base. *Glumes*  $\frac{1}{8}$ - $\frac{1}{5}$  in. long, ovate, acute, membranous, not or obscurely keeled. *Bristles* 0. *Style* 3-fid. *Nut*  $\frac{1}{10}$  in. long, obovoid, acutely triquetrous, apiculate, faces transversely undulate-rugose, black.

Margins of ponds. Kheri (Inayat), Dholpur (Jameson), Bundelkhand (Duthie), Ajmer (Lowrie). *DISTRIB.* Warm regions of the old world.

4. *S. supinus*, *Linn. Sp. Pl.* (1753), 49; *F. B. I. vi*, 655; *Prain, Beng. Pl.* 1160; *Cooke, Fl. Bomb. ii*, 892.

Roots fibrous. *Stems* 4-15 in. high, terete, tufted, sheaths with an oblique mouth sometimes produced in a short erect blade. *Spikelets* 1-8, usually about 3-4 in a single lateral cluster or occasionally a cluster on a ray in addition, situated a little below the apex of the stem,  $\frac{1}{8}$ - $\frac{1}{2}$  in. long. *Glumes*  $\frac{1}{10}$  in. long, ovate, keeled, the keel produced as a suberect muero. *Bristles* 0. *Style* 3-fid. *Nut*  $\frac{1}{10}$  in. long, globosely obovoid, trigonous, one face larger than the other two, minutely apiculate, faces transversely undulate-rugose, black.

Dehra Dun (Gamble, Parker), Saharanpur (Royle), Shahjahanpur, (Duthie), Jhansi (Duthie), Bundelkhand (Duthie). A common weed in rice fields. *DISTRIB.* Most parts of the world.

5. *S. Roylei*, (Nees) comb. nova. *S. quinquefarius*, Ham. ex Bæck. in *Linnæa XXXVI* (1869-70), 701; *F. B. I. vi*, 657; *Prain, Beng. Pl. 1160*; *Cooke, Fl. Bomb. ii*, 892. *Isolepis lupulina*, Nees and I. *Roylei*, Nees in *Wight Contrib.* (1834), 107.

Roots fibrous. *Stems* 6-18 in. high, terete, tufted, when dried and pressed up to  $\frac{1}{10}$  in. wide, often conspicuously septate, sheaths loose, membranous, mouth oblique. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, 1-9 in a single dense lateral head situated about the middle of the stem. *Glumes*  $\frac{1}{8}$  in. long, elliptic-oblong, mucronate, membranous, multistriate, keeled, brownish straw-colored. *Bristles* 0. *Style* 3-fid. *Nut* as for *S. articulatus*.

Saharanpur (Royle), Ajmer (Duthie), Jhansi (Duthie), Gwalior (Maries), Dholpur (Jameson), Aligarh, Etah, Etawah (Duthie). *DISTRIB.* Throughout India, Afghanistan, Turkestan, Africa.

6. *S. squarrosum*, Linn. *Mant.* (1771), 181; *F. B. I. vi*, 663; *Prain, Beng. Pl. 1158*; *Cooke, Fl. Bomb. ii*, 896; *Collett, Fl. Siml.* 564.

Annual, tufted, roots fibrous. *Stems* 2-6 in. high, filiform, terete, sheaths short membranous, the older slit down to the base, leaves 1 in. long or less, filiform. *Spikelets*  $\frac{1}{4}$ - $\frac{1}{4}$  in. long, softly bristly from the tips of the glumes, solitary or 2-4 in a head, bracts 1-3, the largest usually erect (so that the spikelets appear lateral) and about 1 in. long. *Glumes*  $\frac{1}{10}$  in. long excluding the cusp which is slightly recurved and as long as or rather longer than the rest of the glume, trapeziform, suddenly narrowed into the cusp. *Bristles* 0. *Style* minute with 3 recurved stigmas. *Nut*  $\frac{1}{10}$  in. long, narrowly obovoid, trigonous, brown, finally black.

Dehra Dun (Duthie). A common rains weed in flower pots and similar moist places. *DISTRIB.* Throughout India, tropical Africa, China.

7. *S. kyllingoides*, Bæck. in *Linnæa XXXVI* (1870), 733; *F. B. I. vi*, 662; *Prain, Beng. Pl. 1160*; *Cooke, Fl. Bomb. ii*, 895

Perennial, slender stolons sometimes present. *Stems* 3-6 in. high, rarely more, slender, base thickened. *Leaves* half as long as the stem,  $\frac{1}{10}$  in. broad, grass-like. *Head*  $\frac{1}{8}$ - $\frac{1}{4}$  in. diam., terminal, of 5-15 spikelets, bracts 3-4, leaf-like, spreading or pendent, 1-3 in. long. *Glumes* ovate, contracted rather suddenly into a linear obtuse tip. *Bristles* 0. *Style* 3-fid. *Nut* minute,  $\frac{1}{2}$  the length of the glume oblong-obvoid, unequally trigonous, smooth, brown or black.

Dehra Dun (Vicary) Goona (King) Saugor (Vicary) *sive* Clarke. I have seen no specimens from the area. **DISTRIB.** Scattered in India and tropical Africa.

**8. S. Michelianus, Linn. Sp. Pl. (1753), 52; F. B. I. vi, 662; Prain, Beng. Pl. 1158; Cooke, Fl. Bomb. ii, 895.**

Annual, roots fibrous. *Stems* 1-5 in. high, tufted, triquetrous, leafy below, sheaths membranous, striate, the older split to the base, blade as long as or longer than the stem, narrow, grass-like. *Spikelets*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, numerous, in dense terminal heads  $\frac{1}{2}$ - $\frac{2}{3}$  in. diam. bracts several, long, leaf-like with dilated bases. *Glumes*  $\frac{1}{2}$  in. long, elliptic, keel rather broad, 3-nerved, produced as a mucro, margins hyaline. *Bristles* 0. *Style* 2-fid. *Nut* between  $\frac{1}{8}$  and  $\frac{1}{10}$  in. long, fusiform, pale dull brown.

Delhi (Royle) Agra (Jameson) Gwalior (Maries) Kheri (Inayat). **DISTRIB.** Throughout India, Europe, Asia, Algeria.

**9. S. litoralis, Schrad. Fl. Germ. I (1806), 142, t. 5, fig. 7; F. B. I. vi, 659; Beng. Pl. 1161; Cooke, Fl. Bomb. ii, 894.**

Rhizome horizontal, slender. *Stems* 2-3 ft. high,  $\frac{1}{2}$ - $\frac{1}{2}$  in. diam. slightly triquetrous towards the top, sheaths soft, membranous, open, leaves short or 0 or grass-like and very slender for the size of the plant. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, in lax subcorymbose or paniculate umbels situated laterally near the apex of the stem (or lowest bract 1-6 inches long appearing as a continuation of the stem) sometimes reduced almost to a head, rays when present 1-2 in. long. *Glumes*  $\frac{1}{2}$  in. long, elliptic-oblong, membranous, notched at the top, mucronate in the notch by the excurrent slender green keel. *Bristles* 2-7, soft, linear, plumose upwards. *Style* 2-fid. *Nut*  $\frac{1}{2}$  in. long, broadly obovoid, biconvex, dull brown, apiculate, smooth.

Saharanpur (Royle), Gwalior (Maries). **DISTRIB.:** Most parts of the Old World.

**10. S. lacustris, Linn. Sp. Pl. (1753), 48; F. B. I. vi, 658; Collett, Fl. Siml. 564.**

Rhizome horizontal. *Stems* 2-6 ft. high, terete or somewhat trigonous at the top, sheaths membranous ending in an acute tip or blade 4 inches long or longer and floating. *Spikelets*  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, discrete or clustered in once or twice compound umbels sometimes reduced almost to a small head, situated at the apex of the stem the lowest

bract 1-3 inches long, erect, appearing as a continuation of the stem. *Glumes*  $\frac{1}{2}$  in. long, ovate, concave, scarious, tip notched, margins pilose, keel excurrent as a small scabrid muero. *Bristles* 5-6, retrorsely scabrid. *Style* 2-3 fid. *Nut*  $\frac{1}{10}$  -  $\frac{1}{15}$  in. long, obovoid, plano-convex, long apiculate, smooth, pale ultimately dark brown.

Pilibhit (Inayat). DISTRIB.: Kumaon! Kashmir! Afghanistan! Baluchistan! Scattered throughout the world except S. America, abundant in Europe.

11. *S. maritimus*, Linn. *Sp. Pl.* (1753), 51; *F. B. I.* vi, 658; *Prain, Beng. Pl.* 1161; *Cooke, Fl. Bomb.* ii, 893.

Rhizome creeping, nodes dilating into woody tubers. *Stems* 1-3 ft. high, stout, trigonous, sheaths long often clothing the stem to half its height, mouth truncate with a small V-shaped scarious portion, usually split in older leaves, blade grass-like often as long as the stem, coriaceous, scabrid on the margins towards the apex. *Spikelets*  $\frac{1}{2}$ -1 in. long, 3-8 or solitary on each ray or umbel rarely reduced to a head of 1-3 spikelets, rays of unequal length, subcorymbose, bracts several leaflike, the lowest usually much exceeding the umbel. *Glumes*  $\frac{1}{4}$  in. long, broadly ovate, bifid at the apex, membranous, brown or golden-brown, minutely pubescent, the apical lobes more or less fimbriate, keel excurrent as a more or less curved awn. *Bristles* 3-6, unequal, retrorsely scabrid. *Style* 3-fid. *Nut*  $\frac{1}{8}$  in. long, obovoid, one face larger than the other two hence plano-convex rather than trigonous, smooth, bluntly pointed at both ends, pale straw-colored (not seen quite ripe).

Saharanpur (Jameson), Merwara (Duthie, Lowrie), Jhansi (Duthie), Gwalior (Maries), Mainpuri (Duthie), Aligarh (Jameson), Moradabad (Thomson), Kheri (Inayat).

var. *AFFINIS*, C. B. Clarke. *Spikelets* capitate, usually 1-3, ovoid-lanceolate, glumes straw-coloured, almost glabrous. *Style* 2-fid. *Nut* rather smaller but over  $\frac{1}{10}$  in. long compressed biconvex, minutely laeunose (microscopically a honey-combed surface pattern) brown or pale straw-color.

Saharanpur (Royle), Delhi (Royle), Agra (Jameson), Gwalior (Maries), Pilibhit (Inayat), Kheri (Inayat), Bahraich (Inayat), Gorakhpur (Harsukh). According to Clarke the bristles are 4, as long as the nut in var. *affinis*. Neither the number of bristles nor their size is constant. I have found them scarcely half the length of the ripe nut and up to 6 in number. DISTRIB.: World wide in various forms.

12. *S. chinensis*, Munro in *Seem. Bot. Voy. Herald* (1852-57), 423; *F. B. I. vi*, 662; *Prain, Beng. Pl.* 1159; *Collett, Fl. Siml.* 561.

Rhizome stoloniferous. *Stems* 2-7 ft. high, solitary, leafy, sheath loose, mouth oblique, blade often 12 in. long or more,  $\frac{1}{2}$  in. broad, scabrid on the margins and midrib beneath. *Spikelets*  $\frac{1}{4}$  in. long, ellipsoid, in clusters of 3-15 arranged in large terminal compound corymbose umbels, rays up to 5 in. long, bracts several, leafy, the lowest exceeding the umbel, the upper reduced to tubular sheaths. *Glumes*  $\frac{1}{6}$  in. long, ovate, concave, obtuse, keel broad, 3-nerved, margins scarious. *Erieles* 0 (in the local form, sometimes 3, rarely 5, Clarke). *Style* 2-fid. *Nut*  $\frac{1}{30}$  -  $\frac{1}{25}$  in. long excluding the minute stipe and short apiculus, elliptic, compressed, pale dull brown.

Dehra Dun (Gupta). Like many other Himalayan plants this has been found in the Mothronwala swamp. *DISTRIB.*: Himalaya up to 5,500 ft. from Chamba eastward to Burma and China.

### 11. FUIRENA, Rottb.; *Fl. Brit. Ind. vi*, 665.

Annual or perennial herbs leafy to above the middle or to the top. *Leaves* grass-like with an annular membrane at the mouth of the sheath. *Spikelets* many flowered in dense axillary and terminal pedunculate clusters. *Glumes* spirally imbricate, aristate, hairy in the upper half. *Hypogynous bristles* 2-seriate, the outer (or sepals) 3, bristle-like or 0, the inner (or petals) 3, with claws and broad limb or linear or 0. *Stamens* 2-3. *Style* long, slender, glabrous, deciduous, stigmas 3. *Nut* obovoid, trigonous, more or less stipitate, beaked. Species 25 scattered in all warm regions.

Leaves glabrous, glumes with a scabrid mucro,  
inner scales setiform . . . . . 1. *F. Wallichiana*.

Leaves patently hairy, glumes with a hispidly  
hairy mucro, inner scales quadrate . . . . . 2. *F. glomerata*.

1. *F. Wallichiana*, Kunth. *Enum. II* (1837), 182; *F. B. I. vi*, 665; *Cooke, Fl. Bomb. ii*, 897.

Rhizome creeping, short. *Stems* 12-18 in. high, triquetrous, slightly pubescent at the top. *Leaves* 2-8 in. long by  $\frac{1}{3}$  in. broad or less, midrib prominent, sheaths long, ligule pubescent. *Spikelets*  $\frac{1}{3}$ - $\frac{1}{2}$  in. long in corymbose clusters, bracts and branches of the corymb small.

*Glumes*  $\frac{1}{8}$  in. long, excluding the stout scabrid mucro which is  $\frac{1}{20}$  in. long, elliptic-oblong, rounded at the tip below the mucro, pubescent and ciliate, lined with dark red streaks. Outer bristles shorter than the nut, bristle-like, reddish-brown scabrid. Inner bristles similar to the outer, much longer than the nut but irregular sometimes small often 0. *Nut*  $\frac{1}{20}$  in. long, light brown or greyish, trigonous, globose, pyramidal pointed at each end, finely longitudinally ribbed.

Hardwar (Wallich) Goona (King) fide Clarke, Merwara (Duthie). Duthie's No. 4919 from Merwara is the type of var. *evoluta* C. B. Clarke in Fl. Brit. Ind. vi, 666. Clarke has noted on the sheet 'setæ hypogynæ extraordinarily though irregularly developed.' He describes them "petals narrowly elliptic 3-nerved shortly stalked with long linear papillose-scabrous arista, overtopping the nut". He figures them in Illustrations of Cyperaceæ, t. LVIII, fig. 9. I have failed to find anything like this but find the bristles as described above. DISTRIB.: Punjab to the Deccan.

2. *F. glomerata*, Lamk. Ill. I (1791), 150; *F. B. I.* vi, 666; *Prain, Beng. Pl.* 1157; *Cooke, Fl. Bomb.* ii, 898.

Annual, tufted. Stems 4-16 in. high, triquetrous, pilose. Leaves 2-5 in. long, hairy, 5-nerved, sheaths long, more or less patently hairy. Spikelets  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, 3-10 in clusters, axillary and terminal, bracts small. Glumes  $\frac{1}{16}$  in. long excluding the hispid awn which is sometimes nearly as long as the blade, obovate-oblong, tip rounded ciliolate, margins membranous, pubescent, keel 3-nerved running into the awn. Outer bristles small and inconspicuous (or linear as long as the nut C. B. Clarke). Inner scales quadrate, apiculate base cordate with a short slender claw, back with 3 raised veins, the scales appressed to the nut and concealing it. Nut  $\frac{1}{16}$  in. long, stipitate, apiculate, trigonous, globose obovoid, pale brown, smooth.

Bundelkhand (Duthie 7051). DISTRIB.: Central Provinces, Bihar, S. E. Asia, Australia, tropical Africa.

### 12. ERIOPHORUM, Linn.; Fl. Brit. Ind. vi, 663.

Glabrous grass-like herbs, leafy only near the base. Spikelets in compound umbels or corymbs sometimes reduced to few or one spikelet. Glumes spirally imbricate. Hypogynous bristles 6 divided nearly to the base into ligulate segments accrescent and comose in fruit so that the inflorescence becomes cottony. Stamens

1-3, anterior. *Style* slender, glabrous, deciduous, stigmas 3. *Nut* sessile, trigonous, smooth, apex narrowed. Species 10 mainly arctic and N. temperate.

*E. comosum*, Wall. ex Nees in Wight Contrib. (1834), 110; *F. B. I. vi*, 664; Prain, Beng. Pl. 1157; Cooke, Fl. Bomb. ii, 896; Watt, E. D. iii, 266; Collett, Fl. Siml. 565.

Tufted, stems 6-18 in. long, slender, tough, sheaths very short, brown somewhat fibrous, leaves usually longer than the stems, very narrowly linear with serrulate margins. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, narrowly ellipsoid, reddish-brown, very numerous, in compound or decom-pound irregular umbels, bracts several leaf-like exceeding the inflorescence and often 12 in. long or more. *Glumes*  $\frac{1}{2}$ - $\frac{1}{5}$  in. long, ovate-lanceolate, mucronate, 1-nerved, hyaline. *Anthers* large, yellow, with a conspicuous pointed red tip. *Nut*  $\frac{1}{10}$  in. long, trigonous-fusiform, dusky brown, supported by a ring of greyish cottony hairs much longer than the nut.

Dehra Dun and Saharanpur Siwaliks common on cliffs. Saugor. Has much the appearance of Bhabar grass but is readily distinguished by the leaf sheaths being woolly in Bhabar Grass. It is almost always found on steep rocks or hanging from vertical cliffs. DISTRIB. From Afghanistan along the Himalaya and Siwaliks to China. Hilly tracts throughout India.

### 13. LIPOCARPHA, R. Br.; Fl. Brit. Ind. vi, 667.

Glabrous herbs leafy only at the base. Leaves grass-like. *Spikelets* 1-8 in a single terminal head. *Glumes* spirally imbricate, numerous. Hypogynous bristles or perianth of two elliptic hyaline scales as long as and adherent to the nut, one anticus the other posticus. *Stamens* 1-3, anticus. *Style* small, slender, glabrous, stigmas 2 or 3. *Nut* small oblong or ovoid, plano-convex, smooth, invested by the hypogynous scales. Species 13 in warm regions.

*L. argentea*, R. Br. in Append. Tuckey Congo (1818), 459; *F. B. I. vi*, 667; Prain, Beng. Pl. 1157; Collett, Fl. Siml. 565.

Rhizome hardly any. Stems usually 10-20 inches, triquetrous smooth. Leaves half as long as the stem or less, linear-filiform with revolute margins, sheaths striate, deeply slit down. *Spikelets*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, pale straw color or grey, bracts usually 3 the longest 2-6 in. long,

spreading. *Glumes*  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, spathulate-ob lanceolate, apex triangular, keel not prominent, sides hyaline with minute dark specks and streaks. *Scales* nearly as long as the glume, twice as long as the nut, longitudinally nerved and easily torn into fibrous shreds. *Nut*  $\frac{1}{20}$  in. long, subcylindric, slightly widened upwards, obscurely trigonous, brown, microscopically closely punctate.

Dehra Dun (Duthie) Saharanpur (Royle). DISTRIB.: Along the Himalaya 1,6,000 ft. from the Kangra district to Assam. Tropical and subtropical Old World.

14. SCLERIA, Berg.; Fl. Brit. Ind. vi, 685.

Annual or more usually perennial herbs. *Stems* trigonous, leafy. *Leaves* grass-like usually with cutting scabrid edges. *Spikelets* dimorphous, androgynous or unisexual, solitary or clustered on the branches of a panicle, rarely spicate or capitate, primary bracts leaf-like, secondary filiform, Androgynous spikelets with one female flower below and a few male above; female spikelet similar but upper portion reduced to a small rudiment pressed against the nut or 0 when the female flower appears terminal. *Glumes* 2-4 empty below the female glume or in the male spikelets 2 empty below the male glumes. *Stamens* 1-3, anthers often mucronate. *Style* linear, deciduous, stigmas 3. *Nut* bony, shining, gynophore usually prominent, apex dilated often into a 3-toothed saucer. Species 150, in most warm regions.

Annuals with fibrous roots.

Disk 3-lobed, nut with raised reticulations . . . . . 1. *S. tessellata*.

Disk entire, nut smooth . . . . . 2. *S. annularis*.

Perennials with woody rhizomes.

Panicle lax, branches ascending, nut smooth 3. *S. hebecarpa*.

Panicle dense, branches stiff, spreading, nut  
reticulate . . . . . 4. *S. elata*.

1. *S. tessellata*, Willd. Sp. Pl. IV (1805), 315; F. B. I. vi, 686; Prain, Beng. Pl. 1133; Cooke, Fl. Bomb. ii, 993.

Annual, root fibrous, the fibres nearly black. *Stems* 1-2 ft. high, rather slender, hairy or glabrate. *Leaves* 6-12 in. long,  $\frac{1}{4}$  in. broad or less, sheaths more or less winged, the mouth truncate. *Spikelets*

solitary or in small clusters on the branches of a narrow erect terminal panicle. Fruiting glumes about  $\frac{1}{3}$  in. long, broadly ovate, keeled, acuminate, ferruginous green. Nut broadly ellipsoid  $\frac{1}{10}$  in. long, white, with close raised mainly longitudinal reticulations, disk straw-colored with 3 obtuse lobes.

Central India (Wingate), Indore. DISTRIB.: Throughout India except the North-West, Malaya, China, Japan, Australia.

2. *S. annularis*, Kunth, *Enum. II* (1837), 359; *F. B. I. vi*, 687; *Cooke, Fl. Bomb. ii*, 903.

Closely resembles *S. tessellata*. Leaf-sheaths winged, the angles with minute downward directed spinules, the mouth with a short triangular prolongation. Spikelets in the partial inflorescence more densely spicate. Glumes with scabrid keel. Nut smooth, seated on a brown disk with truncate margin.

Saugor (Witt). DISTRIB.: Central and S. W. India, China.

3. *S. hebecarpa*, Nees in *Linnæa IX* (1835), 303; *F. B. I. vi*, 689; *Prain, Beng. Pl. II* 33; *Cooke, Fl. Bomb. ii*, 904.

Rhizome  $\frac{1}{2}$  in. diam. woody, clothed with ovate striate dark red scales. Stem 2-3 ft. high. Leaves 12 in. long  $\frac{1}{2}$ - $\frac{3}{4}$  in. broad, long acuminate, sheaths winged, scabrid, mouth with an ovate hairy prolongation. Spikelets solitary or in small clusters on the suberect branches of a narrow terminal sparingly branched panicle, bracts long filiform. Fruiting glumes 3, broadly ovate, cuspidate, the uppermost  $\frac{1}{2}$  in. long. Nut  $\frac{1}{2}$  in. long, broadly ovoid, obscurely trigonous, apiculate, white, polished, minutely hairy when young, disk pale brown, lobes triangular-ovate, acute  $\frac{1}{4}$ - $\frac{1}{3}$  the length of the nut.

Dehra Dun (Duthie) 2443. DISTRIB.: Throughout India except the N. W., Malaya, China, Australia.

4. *S. elata*, Thw. *Enum.* (1864), 353; *F. B. I. vi*, 690; *Prain, Beng. Pl. II* 33.

Rhizome stout, woody. Stem 3-5 ft. Leaves 12-20 by  $\frac{1}{2}$ - $\frac{3}{4}$  in. narrowed into a long filiform tip, scabrid on the veins and margins, sheaths triquetrous or winged, mouth with a very short rounded hairy prolongation. Spikelets subsolitary, very numerous on the spreading branches of a large stiff pyramidal panicle, bracts long, linear-filiform. Fruiting glumes 3, very broadly ovate, slightly keeled, cuspidate.

the uppermost  $\frac{1}{6}$  in. long. *Nut*  $\frac{1}{6}$  in. long, globose, apiculate, reticulate with shallow pits, minutely hairy on the transverse ridges when young, pale straw-colored, disk with very short rounded lobes the same color as the nut.

Dehra Dun (Gamble). DISTRIB.: Throughout India except the N. W. China, Java.

**15. CAREX**, Linn. Fl. Brit. Ind. vi, 699.

Perennial grass-like herbs. *Stems* triquetrous. *Inflorescence* of simple or more often panicled spikes which are either androgynous or unisexual. Male flowers forming a simple spike each consisting of 3 rarely 2 stamens in the axil of a bract or glume. Female spikelets forming a spike each in the axil of a bract or glume and consisting of a bottle-shaped or compressed glume or utricle which completely surrounds the spikelet which is so reduced as to resemble a simple flower, consisting of a naked ovary, the axis of the spikelet being very rarely evident. *Utricle* completely enclosing the nut, the 2 or 3 stigmas exserted from the commonly 2-fid neck or beak of the utricle. *Nut* compressed or trigonous. Species about 800 throughout the world mainly in cold and temperate regions.

Stigmas 2, utricle compressed . . . . . 1. *C. cernua*.

Stigmas 3, utricle not compressed.

Panicle lax or of few spikes.

Spikes 2-3 in. long, female below male  
above . . . . .

2. *C. myosurus*.

Spikes up to  $1\frac{1}{2}$  in. long, the upper 2-3  
wholly male the rest wholly female . . .

3. *C. Wallichiana*.

Panicle dense, decompound . . . . . 4. *C. condensata*.

**1. *C. cernua***, Bott. Illustr. IV (1876), t. 578; F. B. I. vi, 708; Pflanzenr. IV, 20, p. 353, fig. 56 D-F.

Rhizome stoloniferous. *Stem* 18-30 in. high, triquetrous, scabrid upwards, basal sheaths brown not fibrous. *Leaves* about  $\frac{1}{4}$  in. wide as long as the stem, flat, scabrid. *Spikes* 5-8, dense, cylindric, 1-2 in. long, the terminal usually female only at the top, one or two or

sometimes all the rest shortly male at the base otherwise female, the lower on short spinulose peduncles. *Bracts* foliaceous, much exceeding the inflorescence. *Glumes* obovate-oblong, truncate or emarginate, sides pale brown with small dark spots, keel broad 3-nerved excurrent as a long hispid tip,  $\frac{1}{3}$  in. long including the tip. *Utricle*  $\frac{1}{3}$  in. long, flattened, obovate-acute in outline, minutely stipitate, yellowish or brownish with minute purple spots, apiculate by the very short entire beak.

Kheri (Inayat 22,886). DISTRIB.: Kashmir (Gammie!). Jaunsar (Rogers!). Assam eastwards to Japan with varieties in Australia and S. Africa.

**2. *C. myosurus*, Nees, in Wight, Contrib. (1834), 122; F. B. I. vi, 723; Pflanzenr. IV, 20 p. 258.**

Rhizome stout woody. *Stems* 2-3 ft. high, obtusely triquetrous, smooth leafy, base covered with reddish-brown reticulately fibrous sheaths. *Leaves*  $\frac{1}{2}$ - $\frac{2}{3}$  in. wide, flat, the upper as long as the inflorescence, coriaceous, scabrid. *Panicle* 8-12 in. long, lax, bracts foliaceous, rachis scabrid. *Spikes* 2-3 in. long,  $\frac{1}{3}$  in. broad, long-tailed by the upper male portion. *Glumes*  $\frac{1}{3}$  in. long, ovate-oblong, apiculate, keel green slender, sides chestnut, membranous, margins narrow hyaline. *Utricle*  $\frac{1}{3}$  in. long, ellipsoid, narrowed at both ends, longitudinally nerved, somewhat hairy, beak hispid-scabrid, 2-fid, half as long as the utricle.

Dehra Dun (Sohan Lal). DISTRIB.: Himalaya 2-7,000 ft. from Kashmir to Bhotan, Khasia and Nilgiri Hills.

**3. *C. Wallichiana*, Presc. ex Nees in Wight Contrib. (1834), 129; F. B. I. vi, 747; Prain, Beng. Pl. 1131; Collett, Fl. Siml. 570; Pflanzenr. IV, 20, p. 749.**

Rhizome stoloniferous. *Stems* 12-30 in. high, sharply triquetrous smooth or scabrid upwards, basal sheaths purplish, somewhat reticulately fibrous. *Leaves*  $\frac{1}{2}$ - $\frac{1}{4}$  in. wide, flat, with rigid filiform tips exceeding the stems. *Spikes* 5-6, the upper 2-3 approximate, linear-cylindric, male  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, the rest female, distant,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, dense. *Bracts* foliaceous exceeding the inflorescence. *Glumes*  $\frac{1}{3}$  in. long, ovate or ovate-lanceolate, more or less aristate, pale brown, 3-nerved. *Utricle*  $\frac{1}{3}$  in. long, ovoid, greyish-brown, densely pubescent, abruptly tipped by the short deeply 2-fid beak.

Saharanpur, Moradabad (Thomson), Kheri (Inayat), Bahraich (Inayat), Gorakhpur (Harsukh). DISTRIB.: Afghanistan to Japan.

4. *C. condensata*, Nees in Wight *Contrib.* (1834), 123; *F. B. I.* vi, 716; *Cooke, Fl. Bomb.* ii, 905; *Collett, Fl. Siml.* 568; *C. cruciata*, Kuckenth. *Pflanzenr. IV*, 20, p. 265.

Rhizome thick woody. Stems 2-3 ft. high, obtusely triquetrous smooth, leafy, base thickened, surrounded by the dark-brown fibrous remains of the sheaths. Leaves  $\frac{1}{2}$ - $\frac{2}{3}$  in. wide, flat, the upper exceeding the inflorescence, coriaceous, margins scabrid. Panicle compound, the partial panicles  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, pale brown, dense, the upper approximate, the lower rather remote, long peduncled; bracts leaf-like, bracteoles filiform, rachis hispid. Spikes  $\frac{1}{4}$ - $\frac{3}{8}$  in. long, narrowly oblong, terete, with 3-4 female and several male flowers. Glumes  $\frac{1}{6}$  in. long, ovate-oblong, apiculate, membranous, marked with red dots and streaks. Utricle  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, ellipsoid-trigonous, with a 2-fid beak  $\frac{1}{2}$  the length of the utricle, irregularly ribbed, scabrid-pilose.

Dehra Dun (Duthie 10,714). DISTRIB.: Himalaya from Dalhousie to Bhotan 1-10,000 ft. common.